The New England
Journal of Medicine

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VOLUME 223 DECEMBER 19, 1940 NUMBER 25

A REVIEW OF THE CAMPAIGN TO ERADICATE TUBERCULOSIS*

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ONE of the greatest achievements of the twentieth century will be the subjugation of tuberculosis. We are far enough along in the campaign that started when this association was organized thirty-six years ago to be quite certain that victory eventually will be won, but we must not be too complacent, for we are dealing with a very resourceful opponent who will take advantage of any weakening of our defenses to make a counter-attack. The small group that met in Baltimore and founded the Association for the Study and Prevention of Tuberculosis were brave and determined men. They were living at a time when tuberculosis was causing the death of more than 150,000 persons annually in the United States. This was at the rate of 200 per 100,000 population. The tubercle bacillus had been known to be the causative agent for twenty-two years. Tuberculin, heralded as a cure, had been discredited. About 9000 beds were being used for tuberculous patients, but most of them were for terminal cases. The notable exceptions were the comparatively few beds at the Adirondack Cottage Sanitarium, carefully nurtured by Dr. Edward L. Trudeau, and the small Sharon Sanatorium in Massachusetts, brought into being by his disciple, Dr. Vincent Y. Bowditch. Out of their experience the Rutland State Sanatorium was founded in Massachusetts in 1898. The importance of this event was that it was the first time the civic responsibility for the treatment of tuberculosis had been recognized and accepted by any legislative body.

The name selected for the organization, Association for the Study and Prevention of Tuberculosis, was descriptive of its purpose. The founders recognized that, because little was known about the incidence of infection, methods of transmission, measures of prevention or principles of treatment, the systematic study of the disease was of first importance.

In the early years of the association the stress was put on treatment, later on prevention, then on health education and on case-finding; these four, together with research, make up the forces that under one co-ordinated command are now in the field doing valiant work against the disease. Much has been accomplished. The death rate has dropped 76 per cent in forty years. Critics take pleasure in reminding us that tuberculosis mortality declined steadily before Koch discovered the bacillus or any concerted public-health measures were taken to control it. It is true indeed that we cannot take all the credit for this improvement, as is evident from a study of the vital statistics in Massachusetts which go back to 1842. In the first annual report published that year the registrar lists consumption as causing 22 per cent of all deaths. Let us compare two forty-year periods, one prior to 1900, the other subsequent to that date. From 1860 to 1899 the rate declined from 444 to 254, a drop of 43 per cent. From 1900 to 1939 the rate declined twice as much, from 253 to 36, a drop of 86 per cent. We may assume that the same favorable factors that existed in the period prior to 1900 have continued to operate, and that to them have been added the resources of the health and welfare agencies brought to bear directly and indirectly on the control of the disease. The effect has been to accelerate greatly the rapidity of the fall of tuberculosis from the commanding position it formerly occupied.

We must not be content with what has been accomplished; we have far to go before our objective is gained. Sixty thousand lives a year even now are taken by the tubercle bacillus. The goal of eradication can be visualized in the distance, but it is two generations away if we proceed at our present rate. Our campaign is one of attrition, slow but certain of attaining the objective. In the four decades since 1900 the reduction in mortality from tuberculosis in the United States was 20 per cent in the first, 22 per cent in the second, 33 per cent in the third and 34 per cent in the fourth. We have been quite pleased with this progress and may even have boasted about it. Yes, there are some who go so far as to say that there is no need of building more sanatoriums, that

*The presidential address delivered at the thirty-sixth annual meeting of the National Tuberculosis Association, Cleveland, Ohio, June 3, 1940.

there are enough beds now, and that before long some other use will have to be found for those that we now have. With so many other major health problems to face and solve, we need not be seriously concerned with this contingency. Even now there is a growing demand for institutions to care for patients with cancer, rheumatic heart disease, diabetes and arthritis. For the present, however, a surplus of beds for conversion to other purposes does not exist, nor will it for some years to come.

The tuberculosis mortality, as we have just reviewed it, dropped 33 per cent and 34 per cent respectively in the last two decades. Let us assume, therefore, that this average decline of approximately one third every ten years can be maintained. In that event, the tuberculosis death rate would be 32 in 1950, 21 in 1960, 14 in 1970; forty years from now, in 1980, a rate of 9 or 10 may be anticipated. The bells that ring in the year 2000 may sound the death knell of the tubercle bacillus.

Do you not agree with me that this seems a leisurely way to dispose of tuberculosis? A study of ancient records, however, shows that the disease has been decimating the ranks of mankind for at least four or five thousand years. Its extermination, therefore, in one century of effort would be indeed quite a creditable achievement. Saint Paul, writing to the Hebrews, said: "Now, faith is the substance of things hoped for, the evidence of things not seen." Our faith, then, warrants our believing that the twentieth century will mark the end of tuberculosis. Furthermore, we are warned by Saint James that "faith without works is dead." It is evident, therefore, that work as well as faith will be needed, and if both are used judiciously in the fullness of our knowledge, we can shorten materially the time that we must serve as host to this unwelcome parasite.

The United States Department of Agriculture has led the way in a successful campaign to eradicate bovine tuberculosis. In about twenty years it has overcome a growing menace that seriously threatened the dairy industry. By legislation supported by public opinion a systematic plan was put into effect that involved the repeated testing of all cattle and the slaughter of the positive reactors, with the result that bovine tuberculosis has been practically wiped out. In the early years of this work sporadic testing was done at the request of the individual owners. Segregation of infected animals on farms with clean cattle was tried without success. Infection would spread in spite of elaborate measures taken to prevent it; the herds of unco-operative farmers would transmit the disease to the clean herds of their progressive neighbors. Mandatory legislation requiring all cattle in a given area to be tested was finally necessary to overcome this fault, and also to prevent the shipment of animals from infected sections into accredited areas. In other words, absolute compliance was required before eradication could be accomplished. Lessons can be learned from the veterinarians that are applicable to an eradication program directed against the human type of the bacillus.

The human and bovine bacilli are blood brothers: their method of attack is the same, they wear the same armor, they yield only at death. The success of the agriculturists is due to their persistence along one line: a direct attack on the bacillus with no quarter given, even when this involves the destruction of the host.

Our problem is more complex. We can search out the bacillus, but when we find it we cannot destroy the carrier. We must temporize, we must educate, and by slower methods of prevention we must try to protect others. In our attempt to cure, we often succeed and thus do much to limit the spread of infection. To slaughter human beings on the pretext of affording others protection is deemed illegal and is barred, except in modern warfare. The substitute measure is segregation in institutions. My plea, therefore, is for more beds —one for every tuberculous patient who should have one. The needs of two groups, the patients and the public, should be recognized. Patients are entitled to the best treatment; the public, represented by patients' families and their business and other associates, have a right to protection. Both are served when patients are sent to sanatoriums.

These institutions must be so situated that they are accessible to both patients and their friends and families. They must be made so attractive that patients will remain long enough to receive permanent benefit. Voluntary segregation for treatment is our aim — not in a concentration camp with its attendant discomfort and discontent, but among pleasant surroundings that will compensate in part for the sacrifice made by the patient in leaving home. We have successfully emphasized the advantages of case-finding in recent years. It has kept the institutions filled and has demonstrated the need for enlarging present sanatoriums and building others. But case-finding activities carried beyond this point serve no useful purpose. They are quite futile unless beds are available for the treatment and segregation of patients.

How many beds should we provide to meet this need? There are 732 institutions with a capacity

of 90,000 beds listed in 1938, or approximately 1.5 beds per annual death. They are distributed very unevenly over the country; a few states have enough, but many have too few. It has been shown that a minimum of 2 beds for each annual death is needed where a good case-finding program is carried on and well-equipped institutions are available. Thirteen states have exceeded this quota, and four have as many as 3 beds per death. Far down the list are fourteen states that have not provided even 1 bed per death. If beds in federal hospitals are excluded, five more should be added to this group, making nineteen of the forty-eight states with only meager or almost negligible accommodations. The tuberculosis death rates in thirteen of those states exceeds the average for the country as a whole. The National Tuberculosis Association through its affiliated state organizations should wage a persistent campaign for more sanatoriums in these states to bring them up to the minimum standard.

Here is where the hardest blows can be struck against tuberculosis. The early-diagnosis campaign in these states may well take a holiday while bed-finding takes the place of case-finding as a major activity. Efforts should be centered on arousing public opinion to a point where the people will insist that suitable hospitals are provided for tuberculous patients. Within the limit of their resources people should tax themselves to finance these institutions, both for construction and for maintenance. In states where the property valuation is low, grants-in-aid should be made available from federal funds. Tuberculosis is a pandemic disease and therefore a national problem. If ever a good-neighbor policy is warranted, this is the place to put it into action. Such aid should not be budgeted as charity but as insurance to be expended for self-protection and the common good. When beds for patients are insufficient in number and when waiting lists build up, the delay inevitably costs some patients their chance of cure.

The community is not protected from open cases if these patients remain at home or return there before they cease to be infectious. When a state fails to provide sufficient beds, it is committed to a plan that is wasteful, ineffective and costly. Tuberculosis is controlled little, if at all, by treating only a small percentage of patients and leaving many open cases in the community to sow the seed for another crop of victims, who in their turn will be needing care. If we admit to the sanatoriums only the hopeful cases, we leave in the homes the most active spreaders of disease; and if we admit only the advanced cases to give them terminal care, we leave in the homes the hopeful cases until they in turn need terminal care. The grist is always waiting at the mill. The expense goes on, the march of death is unimpeded. Halfway measures will not suffice to eradicate tuberculosis.

The number of beds needed in a state or community can be computed with fair accuracy by multiplying the number of annual deaths by ten and dividing the result by four. There are 10 active cases of tuberculosis for each death, and 25 per cent of them need and will accept institutional care.

This has been the experience where good case-finding programs are carried out and well-conducted institutions are available to the patients. The maintenance expense in large part must be borne by the public, for few patients are able to pay the cost of treatment. This is most important, because it is useless to build hospitals and then keep patients from obtaining the benefit by putting up a sign announcing that "All must pay who enter here." Tuberculosis is not always a poor man's disease, but savings of considerable amount which a few may possess at the beginning of their illness are expended in most cases long before the course of treatment comes to an end.

Applying our formula to the United States to find the number of patients with active tuberculosis, let us multiply the 60,000 deaths by ten; the result is 600,000, which is approximately correct. The 25 per cent who need and will accept hospitalization will require 150,000 beds. There are now but 90,000, which means that 60,000 more beds are needed to provide a full complement. These are required in order to wage our war against tuberculosis more effectively. It is an attainable objective. The ratio is 2.5 beds per death, and eight states now have that number. If we include the beds in federal hospitals, — which is the logical thing to do because we are planning on a national basis, — there are nine states with this quota. They are Colorado, Connecticut, Massachusetts, Michigan, Minnesota, New Mexico, North Dakota, Rhode Island and Wisconsin. Some others, quite close to this ratio, will soon reach it. Many other states are financially able to comply and should do so. Some states need assistance. The President's plan as represented in a bill to construct hospitals in areas that are unable to provide them is broad enough to include institutions for the tuberculous. A subsidy to help maintain them should be provided so that they may be kept filled to capacity. Tuberculosis is a migratory disease and pays no heed to state lines; therefore, its control should not be the sole responsibility of a state but should be shared by the

national government. Many millions of federal funds have been used during the past few years to pay farmers for not raising pigs, grain and potatoes. Why not use such funds to pay for not raising tubercle bacilli? If a sum equal to a small percentage of such appropriations could be expended for much needed sanatoriums and their maintenance, the crop of tuberculosis would be curtailed, with benefit to the entire population of the United States.

Many additional beds for tuberculous patients placed where most needed should be item Number 1 on our agenda. Health education as it applies to tuberculosis is item Number 2. This has a broad connotation with boundaries that cannot be clearly defined. Everything that tends to improve living conditions of that part of the population who are forced by circumstances to reside in crowded quarters on a diet inadequate in quality or quantity contributes toward the eradication of tuberculosis. In this class of subsidiary factors are better housing, adequate wages and regulation of hours of labor, all of which are highly valuable allies, since they operate beneficently on the fraction of the population that is most vulnerable to tuberculosis. It is unnecessary to speak in much detail of what may be called direct health education within our field; for example, the cause of the disease, how it is transmitted from one to another, the incidence of infection and disease, the susceptibility of certain age and economic groups and the importance of x-ray examination in early diagnosis, all of which are the stock in trade of our craft. So familiar to us are these matters of what ought to be common knowledge that we deceive ourselves, and take for granted that our teaching has accomplished its purpose and that the people as a whole are well informed. We must not jeopardize our favorable position through overconfidence. With the weapons now at our command wielded by the agencies now in the field and working in close harmony, we may expect continued progress toward our goal.

The ultimate surrender of the tubercle bacillus, however, is two generations away, unless new developments in treatment come to our aid. This surrender may be brought about more quickly by discoveries made in the fields of chemotherapy and nutrition. Research in both fields is yielding rich returns. No one could have foretold the brilliant results now being attained by the use of recently discovered drugs that seem to be specific for infections with the pneumococcus, the streptococcus, the gonococcus and the meningococcus. These are diseases that have up to this time resisted the best efforts of physicians to cure or to control. In Massachusetts the mortality from pneumonia for an eighty-year period prior to 1936 declined but 10 per cent; during the same period tuberculosis declined 90 per cent. It appears from this that pneumonia is a harder problem to control than is tuberculosis. Yet suddenly from the research laboratories comes a specific that cures pneumonia. May we not have faith that one will be found for tuberculosis? The other field of research that has yielded rich returns has been nutrition. A group of pathological enigmas, such as pellagra, beriberi, scurvy and rickets, have been found to be caused by the lack of some vital element in the food. These deficiency diseases now have their vitamins that restore to health people who were chronic invalids or were considered hopelessly ill. Possibly the chemists will find a substance that can be used to enhance the resistance of tissues to the tubercle bacillus so that when that invader appears its position will become untenable.

We know that people vary widely in their susceptibility to tuberculosis. The majority have enough resistance to withstand infection without succumbing to disease. This is obvious from the fact that although contact with the tubercle bacillus is a common experience, only about 5 per cent (4.6 per cent in 1938) of all deaths are due to tuberculosis. Another but unknown percentage of patients develop disease of a chronic type from which they recover. In some the bacillus dies out without causing a demonstrable lesion. At the other extreme are cases that run so acute a course that the lung tissue seems literally to melt away as if exposed to the action of some very active enzyme. This mysterious substance, which renders certain persons immune or less susceptible, is inherent in individuals and in some families. The physicians of another day ascribed this trait to a good constitution. We have no better name. Is the resistant individual endowed with a vitamin X which is wanting in susceptible persons? If so, tuberculosis may be classed as a deficiency disease, and the remedy may be found by the biochemists when they isolate this elusive substance and make it available for use. This would be an addition of inestimable value to our defensive measures.

While the chemists of various types and interests are delving in their laboratories, we plodders in the broad fields of physic and education must continue to use the methods that have been proved sound and true. Yet we must be alert and responsive as new procedures are developed, changing our tactics if necessary and varying our course to keep in line with the changing times.

With all the research work being carried on, it seems not unlikely that sooner or later a dis-

covery will be made that will revolutionize the treatment of tuberculosis. I have faith that this will come to pass. Some years ago I was superintendent of a sanatorium for children. The ward for the patients under ten years of age was located near the woods. One day at lunch time it was discovered that two seven-year-old boys named Micky and Jaky were missing. Search was made for them all the afternoon without success. The sun went down and it was getting dark before the two wanderers appeared. Their tear-stained faces with an overlay of grime showed that they had had a difficult day. They were tired but overjoyed to be back and were eager to tell of their adventures. In their play they had wandered into the woods until they had suddenly realized that the buildings were out of sight and nothing familiar could be seen. After walking about for a long time trying to find their way, they sat down and fell asleep so soundly that the shouts of the searchers did not arouse them. When they awoke it was getting dark and they were frightened at the prospect of spending the night in the woods. "What did you do then?" they were asked. Micky replied, "I knelt down by the trunk of a big tree and prayed." "What did *you* do?" Jaky was asked. "I climbed the tree," he answered, "and when I got near the top I could look over the other trees and see the lights of the sanatorium. It was not very far away and we beat it in." This is an example of the effectiveness of faith and work going hand in hand — not one without the other.

The National Tuberculosis Association has been wandering about in an unexplored wilderness for thirty-six years. Although making some false starts, as could be expected with no blazed trails to follow, it has made great progress but still finds much work to be done. When we clear away the underbrush that obscures our vision, or when we reach a high point that will serve as a tall tree from the top of which we may look over the intervening country, we too may find that we are not far from the promised land, and that we can reach it in one generation instead of two.

Middlesex County Sanatorium

THE CONTRACEPTIVE SAFE PERIOD

A Clinical Study

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PERIODIC sterility and fertility during the female sex cycle is an old Biblical concept, the physiology of which has but recently been explained. Ogino[1] and Knaus,[2] having studied independently the ovarian cycle, recommended the use of this periodicity for the control of fertility. The so-called "rhythm method of contraception," based on their theories and on the research of many others, is deliberate continence during the fertile period of the female cycle.

This method has been applied in the Rhythm Clinic of the Free Hospital for Women in Brookline, which at the present writing is the only free clinic in Massachusetts available to patients desiring contraceptive advice. The clinic was opened in June, 1936, and this report covers the work from then until March 31, 1940. Clinic sessions are held once a week.

Methods and Material

The calculation of safe and fertile periods for each patient is made as follows: The sixteenth to twelfth days inclusive before the next expected menstruation constitute for us the period during which ovulation may occur.[2, 3] An admittedly generous allowance of three days before and after this period is added for the viability of spermatozoa[4, 5] and susceptibility of ova,[4, 6] respectively. The theory may be expressed thus: The fertile period extends from and including the nineteenth day before the *earliest* likely menstruation up to and including the ninth day before the *latest* likely menstruation. In each case the apprehended dates of menstruation are derived from the patient's written record of previous catamenial dates.

At the first visit a complete medical, social, marital and obstetric history is taken. Physical examination is made at this time and repeated as often as indicated. The method is explained carefully, and each patient is given a calendar on which are crossed out the days of the theoretical fertile period. The patient is asked to mark the day of her subsequent menstruation as well as the dates of coitus. Every month, immediately following menstruation, these calendars are checked at the clinic, and safe and fertile periods are determined for the en-

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suing cycle. Before the rhythm for any patient can be calculated, a minimum of three previous catamenial dates is required.

Any patient whose menstrual cycles vary so widely in length as to suggest intermittent failure of ovulation[7] is advised not to rely on the clinic. Women recently delivered, as well as those still lactating, are urged to delay attendance until they have had at least three cycles of average and similar length.

It has proved advantageous to both patients and the clinic secretary to have the calendars mailed to the hospital on the day of menstruation, rather than to depend on the patient's return to the clinic on the first available clinic day following menstruation.

Patients who have been using rhythm long enough to be able to apply the method themselves are advised to have their calendars checked every six months. If they neglect to communicate with the clinic for more than six months, a follow-up letter is sent, asking for information. After management by mail had been resorted to in preference to monthly visits by the patient herself, a much more consistent contact was maintained, the possibility of error diminished, and a closer follow-up became possible. Formerly, many patients were lost because of inability to keep in touch with the clinic, and errors due to misapplication of the method were more frequent. A few patients were discharged when it was thought that they were competent to make their own calculations.

Since the opening of the clinic, 225 patients have applied for treatment. The average age at the time of the first visit was 30.4 years, the ages ranging from nineteen to forty-three. Seventy-seven patients were foreign born, and 148 were American by birth. One hundred and ninety-eight patients were Roman Catholic, 22 were Protestant, 1 was Greek Orthodox, 1 was Jewish, and the religion of 3 was unknown.

The families of 149 patients were self-supporting. The families of 6 were receiving partial relief; the husbands of 9 were employed by the WPA, and the families of 42 had no income of their own. No data were available for the remaining 19 patients. Roughly, 25 per cent of the whole group were thus dependent on outside support of some sort.

It is interesting to note that over one third of the women were referred by hospitals (70 patients) and local physicians (11 patients). Fifty-seven patients were referred by the nurses of the Boston Community Health Association. Of the remainder, 33 patients were referred by social agencies and 39 came to the clinic of their own accord or through the recommendation of friends or other patients. Five were sent to the clinic by priests. The sources of the remaining 10 are not known.

Pathological and Obstetric Data

As has already been mentioned, all patients were subjected to physical examinations, and varied pathologic conditions were discovered. Some of these were obvious from the patients' histories, or constituted the reason for referral. The infrequency of the latter suggests a considerable reluctance on the part of doctors and clinics to refer patients whose health would be endangered by a subsequent pregnancy. Only 24 of our patients belonged in this category. These were 2 cases of malnutrition, 8 of tuberculosis, 5 of rheumatic heart disease, 5 of chronic nephritis and 1 each of hyperthyroidism, breast tumor, hydronephrosis and asthma. In addition to these 24, 4 patients were classified as psychoneurotics and 2 had untreated syphilis.

Other pathologic conditions of less importance were found in 141 patients. The commonest defects were chronic cervicitis (54 cases) and perineal lacerations (35 cases). A large number of insignificant and incidental conditions such as are found in any clinic population were diagnosed.

The whole group reported a total of 1004 pregnancies, of which only 113 were abortions. The latter occurred in 73 patients. According to statements made there were only 10 induced abortions. These figures are too low, since the thorough investigations of Taussig[8] and of Wiehl[9, 10] have shown that abortions are about twice as frequent as here indicated, and that between one and two thirds of all abortions are not spontaneous. The fact that reliable data on this subject cannot be obtained in a single time-limited interview has been stressed by the same authors.[9–12]

Of the pregnancies, 891 were full term, but at the present writing there are only 823 living children. The average number is 4.4, ranging in various families from one to fourteen children respectively. Ten patients had had no children or pregnancies. Eight patients had undergone fifteen cesarean sections, the maximum being four in the same patient. Three patients had had toxemia with one or more of their pregnancies, and 1 each had had placenta previa, tubal pregnancy and subinvolution.

Results

Of the 225 patients who applied for treatment, 12 were rejected immediately because of irregularity of periods, and 6 were not treated because

they were found to be pregnant at the time of their first visit. Twenty-four patients became pregnant while under treatment. Ninety-five cases were closed for the reasons given below. Eighty-eight cases were active as of March 31, 1940.

Of the 207 accepted patients, 57 were treated from 6 months to 1 year, and 63 were treated longer than 1 year, that is, 120 for at least six months (Table 1).

Among the 207 patients actually cared for, there were 24 pregnancies. Three of these were planned, leaving 21 pregnancies that might be considered

TABLE 1. *Duration of Treatment in Accepted Cases.*

Status of Patient	Duration of Treatment: one visit	less than 6 months	6 to 12 months	over 1 year	Total Cases
Active	5	24	26	33	88
Pregnant	0	3	4	17	24
Closed	27	28	27	13	95
Totals.....	32	55	57	63	207

failure of treatment: a gross uncorrected failure rate of 10 per cent. Fourteen of the undesired pregnancies, however, were due to failure of the patients to follow instructions: 10 patients neglected to keep in contact with the clinic for readjustment of their rhythm, made necessary by changes in menstrual habit; 4 patients had intercourse one or more times during the fertile period.* One patient became pregnant after miscalculation of her rhythm in the clinic. These 15 pregnancies can hardly be considered failure of the method, although they are due to inaccuracy in application. Deducting these 15 from the total of 21 pregnancies, we find only 6 pregnancies among 207 patients, giving a corrected failure rate of 2.9 per cent. These 6 patients became pregnant despite the fact that they had followed instructions of the clinic. Assuming the reliability of the patients' statements, they must be regarded as true failure of the method as contrasted to failure due to misapplication or miscalculation, and they present a definite challenge to the theoretical foundations of the Ogino–Knaus method. Since 2 of these patients with true failure had been treated for three and four months respectively, the remaining 4 constituted only 3.3 per cent of the 120 patients who were observed and treated for six months or more.

The histories of the 6 patients with true failures showed that their fertility was no greater than that of the whole group, nor did the length of their cycles vary any more from the norm than did the cycles of other women. Only 3 of these patients had a mean deviation of more than 2.5 days (the average of the total group) in the length of successive cycles. It is therefore hardly justifiable to conjecture that some, if any, of these patients had frequent anovulatory cycles, which might disturb the theoretical relation between menstrual flow and ovulation. That such anovulatory menstruation occurs is generally accepted,[7] although the possibility of ovulation outside the theoretical range of sixteen to twelve days before the subsequent menstruation is real, if not proved.[7, 13]

In our series no pregnancies could be ascribed to gross irregularities in menstrual cycles. For further details of the 21 undesired pregnancies the reader is referred to Table 2.

There were 95 patients who discontinued treatment for a variety of reasons. It is difficult to compile an accurate list of these, for often a single couple may have had more than one such motive. Also, many of these patients were lost despite repeated letters and visits. Somewhat arbitrarily we have analyzed the group as in Table 3. Many of these patients were under treatment for only short periods, and in both the dissatisfied and lost groups, totaling 76 patients (37 per cent), almost half the patients had only one contact with the clinic (13 out of 29 dissatisfied, and 20 out of 47 lost). Only those patients who made a definite statement to that effect were classified as dissatisfied. Although the clinic follow-up facilities are limited, the high percentage of the lost cases is due in great part to unknown addresses, and failure to respond to repeated letters. It is reasonable to assume that most of these cases fall into the dissatisfied group.

It was necessary to stop the treatment of 2 patients because their periods were so irregular that no reasonably long period of safety could be calculated. Together with the 12 patients rejected at the time of their first visit for the same reason, they constituted 6.2 per cent of those who applied. However, the cycles of all the patients who discontinued treatment were even less irregular than were those of the active group. The mean deviation from the average cycle among the closed cases was only 2.1 days, as contrasted with 2.9 days for the patients still active to date.

Six patients had used the method only while waiting for operative correction of various gynecologic disorders which entailed sterilization.

Finally, 7 patients were discharged: 4 because they were familiar enough with the method to continue it without supervision, and 3 because they desired pregnancy.

*Eleven other patients who did not become pregnant also had had intercourse during the fertile period.

Effectiveness of Method

It is difficult to evaluate this method of contraception. For about 6 per cent of the women it was inapplicable; at least 14 per cent of those who could use it were dissatisfied; approximately 6 per cent were incapable of observing the rules; and finally, about 3 per cent of the patients suggested true failure of the method. Our figures indicate that though the corrected failure rate among 207 patients is only 3 per cent, the method is inappropriate for about one third of women (a figure corroborated by Taussig[14]). On the other hand, it must be admitted that the high percentages of failures and dissatisfaction were caused in large part by lack of co-operation on the part of the patients. Perhaps this may be due to the fact that no distinct ailment reminds the patient constantly to follow the physician's prescription or instructions, and that a definite period of continence may possibly thwart established marital habits. As to the accuracy of the theory of rhythm, it has already been stated that there were only 6 patients (3 per cent) who constituted true failures; that is, in the sense that the occurrence of their pregnancies could not be reconciled with the concept of rigid periods of sterility and fertility.

A favorable comparison may be made with other contraceptive measures, if only these 6 cases are considered true failures. Since only 10 patients in our series admitted the practice of contraception before they came to the clinic (mostly in the form of withdrawal), the experience of this small group cannot serve for comparison. But in this respect the publications of Stix and Notestein[15] are of interest, and we have attempted to analyze our results accordingly.

Table 2. *Data Concerning Patients Who Became Pregnant.*

Case No.	Length of Treatment	Menstrual Range	Fertile Period	Cause of Pregnancy
	mo.	*days*	*day of cycle*	
1	7	25–32	6th to 23rd	Rhythm not readjusted after range exceeded 32 days
8	14	29–36	10th to 27th	Unexplained: no coitus in fertile period
15	27	26–29	7th to 21st	Rhythm not readjusted after range exceeded 29 days
19	8	27–31	8th to 22nd	Rhythm not readjusted after 32-day cycle, and patient had coitus on 23rd day
24	29	29–32	9th to 23rd	Rhythm not readjusted after 33-day cycle
31	16	24–27	5th to 18th	Rhythm not readjusted after range exceeded 27 days
36	32	25–30	6th to 21st	Rhythm not readjusted after range exceeded 30 days
37	22	26–30	7th to 21st	Rhythm not readjusted after range exceeded 30 days
45	4	27–31	8th to 22nd	Intercourse on 9th day
56	21	30–35	11th to 26th	Unexplained: no coitus in fertile period
64	15	30–36	11th to 27th	Intercourse during fertile period
70	4	25–28	6th to 19th	Unexplained: no coitus in fertile period
79	30	26–30	7th to 21st	Rhythm not readjusted after range exceeded 30 days
80	24	27–31	8th to 22nd	Rhythm not readjusted after range exceeded 31 days
99	22	27–33	8th to 24th	Unexplained: no coitus in fertile period
108	17	27–32	8th to 23rd	Rhythm not readjusted after range exceeded 32 days
124	22	28–31	9th to 22nd	Rhythm not readjusted after range exceeded 31 days
133	16	26–33	7th to 24th	Unexplained: no coitus in fertile period
136	7	26–33	7th to 24th	Had intercourse on 8th day
187	6	25–30	6th to 21st	Had intercourse on 20th and 21st days
206	3	28–31	9th to 22nd	Unexplained: no coitus in fertile period

Table 3. *Reasons for Discontinuing Treatment.*

Reason	Number of Patients	Per Cent of Accepted Patients
Separated	4	2
Sterilized	6	3
Discharged	7	3
Dissatisfied	29	14
Lost	47	23
Periods too irregular	2	1
Total	95	46

From our records we can calculate the time of exposure to pregnancy during the marital life for 109 patients who have been treated for more than six months. To do this, the actual time of any previous gestation is subtracted from the total number of years married, as are also the periods of previous contraceptive practice. By totaling the number of pregnancies which these patients underwent in the past, before treatment on the one hand, and during treatment on the other, pregnancy rates per 100 person-exposure years can be established and compared. The aforementioned 109 cases had an aggregate total of 600 years of married life with 543 pregnancies (55 of the latter were abortions). This gives an index of 90 pregnancies per 100 person-exposure years. The aggregate periods of treatment for this group of 109 patients totals 143 person-exposure years. There were 16 undesired pregnancies in this group. This gives an index of 11 pregnancies per 100 person-exposure years under treatment, as against 90 be-

fore treatment.* If we include, however, only the 6 pregnancies which have been considered true failures of the method itself, the rate is 4 pregnancies per 100 person-exposure years. Both figures compare favorably with those of the studies made under the auspices of the Milbank Memorial Fund[15] of condom, withdrawal and douche practices without clinic supervision — 31.5, 36.4 and 5.4 pregnancies, respectively.

However, to temper this favorable comparison it must be reasserted that our figures apply to a self-selected group to most of whom no alternative in the way of birth control is open, whereas 6 per cent of the applicants were found unacceptable to the method, and in 37 per cent the method was unacceptable to the patient.

Summary and Conclusions

A report is made of the work in the Rhythm Clinic at the Free Hospital for Women, Brookline, Massachusetts, covering a period beginning in June, 1936, and ending March 31, 1940. Two hundred and twenty-five patients applied for treatment during this time, 88 of whom were on the active list at the time of writing.

Our conception of the theory of the safe period is this: The sixteenth to twelfth days inclusive before the first day of the next menstruation constitute the period during which ovulation occurs. An admittedly generous allowance of three days before and after this period is made for viability of spermatozoa and susceptibility of ova, respectively.

The postulated fertile period therefore extends from and including the nineteenth day before the earliest likely menstruation up to and including the ninth day before the latest likely menstruation.

One hundred and twenty cases have been treated for more than six months and have been the source of valuable data as regards the cyclic aspects of ovarian physiology, besides allowing the following conclusions as to the merits of the safe period theory in practice:

The average variation in the cycles of the patients treated was less than five days. Fourteen patients (6 per cent) of those who applied for treatment had to be rejected because of gross irregularities of their periods.

When the method is strictly observed, the corrected percentage of failures is 3 per cent. Only 6 pregnancies are considered true failures, for only they cannot be explained in accordance with the theory.

If one includes the pregnancies in 15 patients who failed to take into account variations in their cycles beyond the previously established range, or who neglected instructions regarding the unsafe period, a gross percentage of failures of 10 is obtained.

Pregnancy rates expressed as number of pregnancies per 100 person-exposure years were 90 for our patients before treatment, as contrasted to 11 for the exposure period under clinic supervision. The corrected rate for the true failures was only 4 pregnancies per 100 person-exposure years. These rates compare favorably with those compiled for other contraceptive methods.

The number of patients who discontinued treatment because of dissatisfaction or lack of interest was high, constituting 37 per cent of the accepted patients.

It has been found advantageous to maintain a close contact, preferably by mail, with all patients, since errors in application were common, even among intelligent patients and among those who had been under treatment for long periods.

We conclude that the safe-period method constitutes a workable form of contraception for a selected group of women. On the other hand, it is doubtful whether the method is reliable enough for individual cases in which contraception is an essential safeguard of the patient's health.

*The records, which include data before and after treatment, show that our patients continued these coital habits during the allotted safe period.

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THE DIAGNOSTIC SIGNIFICANCE OF SEROUS FLUIDS IN DISEASE*

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A SURVEY of the literature reveals surprisingly little published evidence to support the statements commonly made in textbooks of clinical pathology on the characteristics of pathologic serous body fluids. These dicta have usually been borrowed from earlier authors, who in turn have presented no basis for them. In routine clinical work, exceptions to traditional interpretations are so numerous that one is inclined to disregard laboratory studies of fluids, thus losing a valuable diagnostic aid, or to put too much faith in a determination that is liable to various errors. The purpose of this paper is to ascertain what diagnostic aid may be obtained from the characteristics of pathologic serous body fluids as demonstrated by easily performed tests.

Although paracenteses were practiced as early as the time of Hippocrates, the study of the fluid thereby obtained has been going on for only a century. One of the earliest investigations of the chemical constituents was that of Marcet[1] in 1811, when paracentesis was still a doubtful procedure. A quarter of a century later Guérin[2] declared that the practice of thoracentesis must continue, despite the small number of successes, since it offered the only hope of recovery. The first major work on the cellular constituents was done by Widal and Ravaut[3] in 1900.

MATERIAL

From the case records chiefly of the Peter Bent Brigham Hospital, but also of the Boston City, Beth Israel and Children's hospitals, data recorded on over 1300 fluids were collected and classified; only those in which there was no reasonable doubt as to the diagnosis were accepted. The technic employed in carrying out the various tests was basically uniform, even though some had been performed as long as twenty-five years previously.

OBSERVATIONS

Specific Gravity

It is commonly stated in the current textbooks on clinical pathology that the dividing line between infected and noninfected fluids occurs at the specific gravity of 1.016, although little experimental work to support this statement could be found in the literature. Reuss[4] in 1881 and Runeberg[5] in 1884 did some work on this subject, but they emphasized the relation of the specific gravity to the protein content. The results of an attempt

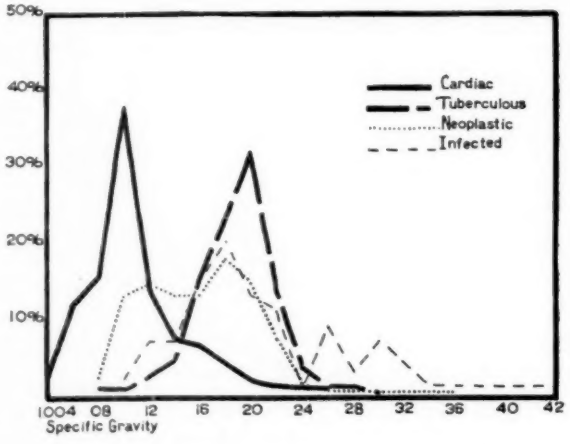

FIGURE 1. *The Distribution of the Specific Gravities of 313 Cardiac, 290 Tuberculous, 123 Neoplastic and 100 Infected Pleural Effusions.*

at differentiation on this basis can be seen in Figures 1 and 2, where 863 pleural and 468 peritoneal effusions are compared. From the pleural cavity,

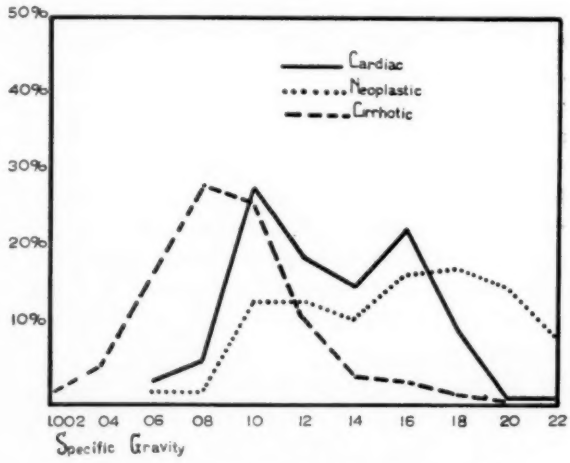

FIGURE 2. *The Distribution of the Specific Gravities of 100 Cardiac, 60 Neoplastic and 270 Cirrhotic Peritoneal Effusions.*

313 cardiac fluids showed an average specific gravity of 1.010, with 10 per cent 1.016 or more; 290 tuberculous fluids showed an average specific gravity of 1.020, with 10 per cent 1.016 or less; 100 effusions associated with pulmonary infection av-

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eraged 1.019, with a range of 1.010 to 1.042; 123 neoplastic fluids showed no peak, but a plateau ranging from 1.010 to 1.020; 21 cirrhotic effusions averaged 1.010, with a range of 1.004 to 1.019; and 16 nephrotic fluids averaged 1.006 with a range of 1.001 to 1.008. From the peritoneal cavity, 270 cirrhotic fluids showed an average specific gravity of 1.009; 60 neoplastic effusions showed a plateau of 1.010 to 1.020; 21 tuberculous fluids averaged 1.020; 17 nephrotic fluids averaged 1.007, with a range of 1.003 to 1.012; and 100 cardiac effusions

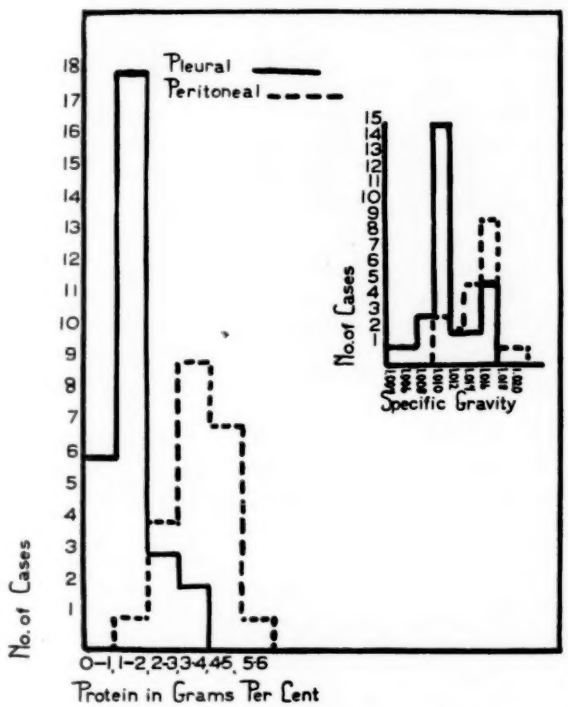

FIGURE 3. *The Distribution of Protein Levels and Specific Gravities in Cardiac Fluids.*

averaged higher than those from the pleural cavity, 34 per cent having a specific gravity of 1.016 or more. A similar discrepancy between the cardiac pleural and peritoneal fluids was found in the protein content (Fig. 3). No explanation for this was found on reviewing the case records.

Of the cardiac pleural fluids, approximately 75 per cent were withdrawn from the right chest cavity, a phenomenon for which several explanations have been offered.[6] Cirrhotic and nephrotic effusions are usually of low specific gravity, probably because the mechanism involved in their formation depends on lowered blood-colloid osmotic pressure rather than on increased venous pressure or increased capillary permeability.

The determination of the specific gravity is liable to many errors. As can be readily found in textbooks of physical chemistry, the specific gravity of solutions is markedly affected by temperature. In simple experiments using the ordinary laboratory hydrometer (urinometer), it can be shown that raising a serous fluid from room to body temperature may decrease its specific gravity by as much as 0.008 to 0.010. The common hydrometers now on the market are corrected for a temperature of 60°F. (15.5° C.), a level of temperature that is rarely found in the routine laboratory. Even when the specific gravity of a serous fluid is determined by weight, a similar change is noticed.[7] In the above tabulations, it is probable that most of the fluids were studied at or near the usual room temperature of 70°F. and therefore showed a specific gravity slightly lower than that actually present. This error was essentially constant throughout. (The specific gravity determinations on urine are of course subject to the same error.[8]) In both transudates and exudates the clot, which usually forms after the fluid has been standing for an hour or two, has almost no effect on the specific gravity.[7] Abnormal lipid content is said to have

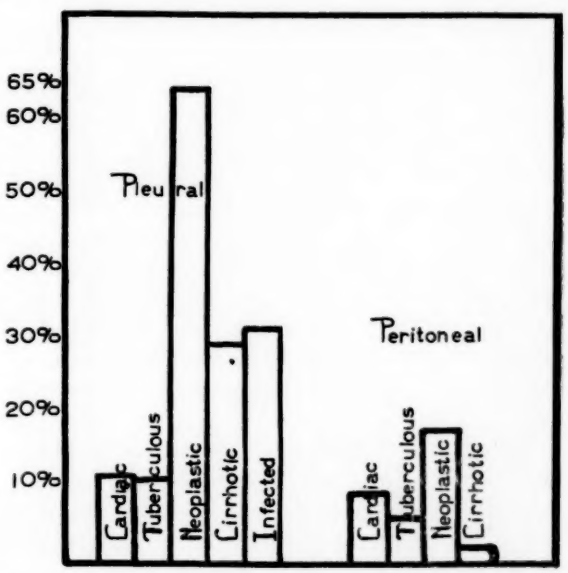

FIGURE 4. *The Percentage of Various Types of Effusions with a Red-Blood-Cell Count of 10,000 or More.*

These figures are based on observations in 274 cardiac, 164 tuberculous, 100 neoplastic, 13 cirrhotic and 59 infected pleural fluids and 46 cardiac, 15 tuberculous, 49 neoplastic and 135 cirrhotic peritoneal fluids.

little effect on the specific gravity, at least in the plasma.[9] Lowering of the blood protein undoubtedly plays some part in lowering the protein content of effusions.

Cellular Constituents

Another examination commonly made of these fluids is that of the total number and percentage composition of the various blood cells. Observa-

tions in 611 pleural and 245 peritoneal fluids showed that bloody or blood-tinged fluids, that is, those containing 10,000 or more red blood cells per cubic millimeter, were not strikingly characteristic of any of the specific types except the neoplastic (Fig. 4). A red-cell count of 10,000 or more was found in 65 per cent of neoplastic fluids, 31 per cent of fluids associated with pulmonary infection, 30 per cent of cirrhotic fluids, 11 per cent of cardiac fluids and 10 per cent of tuberculous fluids in the pleural cavity; in the peritoneal cavity this red-cell count was found in 20 per cent of neoplastic, 10 per cent of cardiac, 7 per cent of tuberculous and 1 per cent of cirrhotic effusions. The trauma incidental to the paracentesis may play a part in elevating the red-cell count, since the leakage of but 2 cc. of normal blood into 1000 cc. of fluid would give a count of 10,000. In the nontraumatic pleural fluids, a marked elevation of the red-cell count, that is, above 100,000, was excessively rare except in neoplastic fluids, where it occurred in 12 per cent of the cases. Only 1 per cent of the cardiac pleural fluids had such a large number of erythrocytes. Contrary to the common opinion, bloodiness in tuberculous effusions is unusual. That the occurrence of blood in significant amounts is much less common in peritoneal fluids than in those from the pleura is probably explained by the greater volume of fluid in the former, which causes a greater dilution of whatever blood may flow into it. Even markedly hemorrhagic effusions may not exhibit frank blood clots unless they have been withdrawn soon after the bleeding has taken place. Denny and Minot[10] have shown that this is due to intrapleural clotting and defibrination, rather than to any specific anticoagulant.

The total and differential white-cell counts have been studied by many investigators.[11–13] In an analysis of 759 pleural and 389 peritoneal effusions, the count was found to be above 1000 in the pleural cavity in 85 per cent of fluids associated with pulmonary infection, and 73 per cent of tuberculous, 42 per cent of neoplastic, 27 per cent of cirrhotic and 10 per cent of cardiac fluids; in the peritoneal cavity such an elevation was found in 76 per cent of tuberculous, 51 per cent of neoplastic, 11 per cent of cirrhotic and 10 per cent of cardiac effusions (Fig. 5).

The differential white-cell count is of little value in the individual case, with the exception of nontuberculous infected fluids, where a polymorphonuclear leukocytosis is the rule. In 229 tuberculous pleural fluids, there were 9 proved cases in which the polymorphonuclear cells constituted 50 per cent or more of the total count. According to experimental work, such a neutrophilia may appear early in the disease.[14] In 13 of 232 cardiac pleural fluids, in 21 of 198 cirrhotic peritoneal fluids and in an occasional neoplastic effusion, the total white-cell count consisted of more than 50 per cent polymorphonuclear cells, even though no infection was

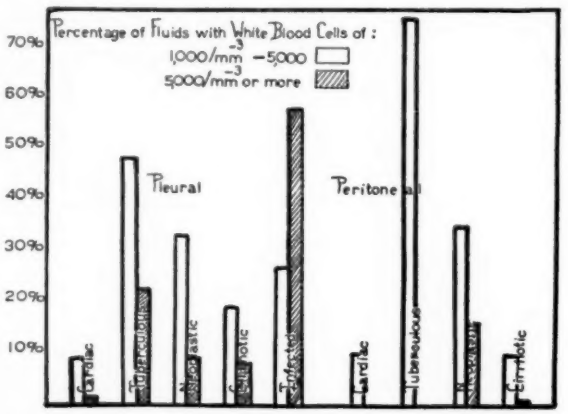

FIGURE 5. *The Percentage of Various Types of Effusions with a White-Blood-Cell Count of 1000 or More.*

These figures are based on observations in 278 cardiac, 250 tuberculous, 104 neoplastic, 26 cirrhotic and 101 infected pleural fluids and 69 cardiac, 13 tuberculous, 51 neoplastic and 256 cirrhotic peritoneal fluids.

present. Neoplastic cells have been identified in effusions with varying results, and no fixed criteria for their recognition have been accepted.[15]

Chemical Constituents

Determinations of the protein content of the various types of effusions have been made by numerous investigators.[11, 13, 16–19] Table 1, which summarizes 170 protein determinations, shows that there may be wide variation, so that no absolute differentiation of the various types is possible on this basis. In the literature[11, 20, 21] there is considerable disagreement as to whether the protein content of a serous fluid bears any such frank relation to its specific gravity as has been shown in the blood[22] and lymph.[9] A rough relation is apparent in Figure 3. Investigations showing that such a relation does exist have been completed, and are to be reported.[7]

TABLE 1. *Protein Content of Different Types of Effusions.*

Type of Fluid	Pleural			Peritoneal		
	No. of Cases	Protein Average	Protein Range	No. of Cases	Protein Average	Protein Range
		gm. per 100 cc.	*gm. per 100 cc.*		*gm. per 100 cc.*	*gm. per 100 cc.*
Cardiac	29	1.6	0.2–3.6	21	3.7	1.5–5.3
Tuberculous	3	4.2	2.7–5.1	0		
Neoplastic	9	3.4	2.1–4.6	15	3.2	1.5–4.2
Cirrhotic	5	1.8	0.6–3.2	69	1.2	0.6–3.2
Nephrotic	10	0.4	0.1–1.0	9	0.3	0.1–0.9

The protein content of transudates tends to rise with resorption; that of exudates may vary in

either direction but usually is lower.[23–27] Such factors undoubtedly account at least in part for the wide range of the protein concentration. Yamada[28] found in a large series of cases that pleural fluid obtained from normal persons contained an average of 1.77 gm. of protein per 100 cc., with a range of 1.38 to 3.35. The albumin-globulin ratio tends in general to be like that of the blood, so that it is most commonly found reversed in cirrhotic effusions. The effect of clotting on the protein content of the fluids is slight.

Other chemical constituents of pathologic fluids have not been significant in determining the cause of the effusion. Readily diffusible substances, such as bilirubin, nonprotein nitrogen substances and sugar, are in essentially the same concentration as they are in the blood, and ionized substances, which are subject at least in part to Donnan's equilibrium, appear at different levels. Total fats are usually quite low. The cholesterol content may occasionally show a considerable elevation without any frank relation to the blood content; it has a tendency to be elevated in neoplastic disease.[29]

Unusual Fluids

The finding of a *milky* or *chylous fluid* on paracentesis has proved sufficiently unusual to bring about the careful study of a number of samples.[30] An effusion should not be diagnosed as chylous unless a thin layer of it has a white opacity, like milk, since a certain degree of haziness or opacity is common in transudates, particularly in those associated with cirrhosis and nephrosis. In general, the chylous fluids have been divided into those associated with obvious thoracic-duct obstruction and those where no such lesion was found. Since these two types cannot be differentiated by ordinary laboratory methods, such a division seems worthless for the clinician, particularly because rupture of the thoracic duct has repeatedly been demonstrated to be an inconstant cause of such fluids because of collateral circulation.[31, 32] Occasionally the milkiness has been found to be due not to an ordinary fatty material but to a lecithin-globulin complex.[33] In cases unassociated with obvious traumatic rupture of the thoracic duct, the commonest causes of milky fluid in order of decreasing frequency are neoplasm, tuberculosis, nephrosis and cirrhosis. Among the 12 cases encountered with chylous fluids the underlying disease was cirrhosis (5 cases), neoplasm (3 cases), nephrosis (2 cases) and subacute bacterial endocarditis (1 case); in 1 case, that of a child, it was associated with volvulus.[34] In 1 of the cases where cirrhosis was proved at autopsy, variation in the dietary intake of fat had no effect on the degree of milkiness, which decreased with consecutive paracenteses. The diagnosis of chylous effusion may occasionally be made on x-ray examination, since the fluid, owing to its unusually high fat content, does not hinder to any extent the passage of the rays as do other effusions.[35]

Eosinophilic fluid is discussed periodically in the literature, with no definite conclusion as to its etiology.[36] In at least two thirds of the cases the fluid is also bloody, a finding perhaps related to that of Cunningham,[37] who discovered the most pronounced eosinophilia in those cases of chronic pleurisy artificially induced by washed or laked red cells. The wide number of reported underlying diseases suggests a complete lack of specificity of this finding. In the 14 eosinophilic fluids found during these investigations, all but 3 were bloody. Six of them were apparently due to a benign pleurisy of unknown cause in which guinea-pig inoculations proved negative for tuberculosis; 4 were associated with neoplasm, 2 with cardiac decompensation (after repeated taps) and 2 with empyema. Only occasionally did the circulating blood show an eosinophilia. In this connection it may be added that Charcot–Leyden crystals have occasionally been reported in effusions.[38] In but 1 of all the cases here collected was such a finding reported, the diagnosis being cardiac decompensation.

On the subject of *cholesterol effusions* the reports in the literature are in close agreement.[39] The fluid, described as being filled with golden, glittering particles, is shown microscopically to consist of characteristic cholesterol crystals in suspension. Almost all the fluids reported had been found years after a spontaneous untreated pleurisy, peritonitis or pericarditis, and in some, tubercle bacilli were demonstrated. Only one doubtful example was found in the cases reviewed here.

Mucinous effusions, particularly from the peritoneal cavity, are occasionally reported in the literature and are apparently always associated with neoplasm.[40, 41] In this series, 2 such fluids were found. In one, a case of peritoneal carcinomatosis, the abdominal fluid, described as glairy, had a specific gravity of 1.010 with a total protein content of 2.5 gm. per 100 cc. The other case, that of a patient apparently suffering from carcinoma of the ovary metastatic to the peritoneum and pleura, had mucinous fluid in both cavities; the fluids had a specific gravity of 1.018 and a protein content of 4.5 gm. per 100 cc.

Rheumatic effusions, which occur in a small fraction of cases of acute rheumatic fever, exhibit many of the properties commonly ascribed to exudates with a relatively high specific gravity, a tendency to bloodiness, and rapid clotting thought to

be due to a high fibrin content.[42] In the 9 cases studied at the Peter Bent Brigham Hospital, no comment was made of rapid clotting. In the 8 cases in which the specific gravity was noted, 4 were 1.017 or more. The white-cell count ranged from 370 to 33,600 and the red-cell count from 77 to 45,000.

A review of the literature on the characteristics of *pericardial fluids* reveals that very little investigation has been done. Although the amount of fluid normally found in the pericardial sac surpasses that found in the pleural and peritoneal cavities, only four references could be found to protein determinations of normal pericardial fluid, and all were done before the development of modern chemical methods. The fluid in tuberculous pericarditis is usually of a high specific gravity and is more frequently sanguineous than the fluid of a tuberculous pleurisy, according to the literature.[43, 44] In 3 cases of tuberculous pericardial effusion examined in this series, the specific gravity was 1.018 or more in all, with the red-cell count exceeding 10,000 in all but one of 7 specimens examined. Bloody pericardial fluid may be found in a variety of conditions, including rupture of the coronary vessels, tumors of the heart and pericardium, chronic nephritis and nontuberculous pericardial infections.[44] Clotting of these fluids occurs only when they are withdrawn shortly after their appearance. Even when chylous pleuritic and peritoneal fluids are present, chylopericardium is very rare. Only 3 cases have been reported.[30] Occasional cases of cholesterol pericarditis have been seen.[45]

Summary and Conclusions

The customary division of transudates from exudates at the specific gravity of 1.016 has been found to be true only in certain diseases. Thus in pleural effusions, 90 per cent of cardiac fluids have a specific gravity of 1.016 or less, and 90 per cent of tuberculous fluids have a specific gravity of 1.016 or more. In ascites, 95 per cent of cirrhotic effusions are in the transudative range, and no cases of tuberculous peritonitis were found in which the specific gravity was considered typical of transudates. In nontuberculous infected pleural fluids, on the other hand, 31 per cent are of specific gravity 1.016 or less, and 34 per cent of cardiac peritoneal effusions have a specific gravity of 1.016 or more.

Neoplastic fluids from both the pleural and peritoneal cavities are about evenly divided between the exudative and transudative specific gravities.

Nephrotic fluids have a uniformly low specific gravity in the pleural and peritoneal cavities.

The specific gravity of cardiac peritoneal fluids is usually higher than that of cardiac pleural fluids.

The chief cause of error in the determination of specific gravity is the temperature of the fluid, which may change the specific gravity by as much as 0.008 to 0.010.

The etiology and characteristics of 12 chylous, 14 eosinophilic, 2 mucinous and 8 rheumatic effusions from the pleural and peritoneal cavities and 3 tuberculous effusions from the pericardial cavity, are presented.

Bloody or blood-tinged fluids from both the pleural and peritoneal cavities are predominantly neoplastic in origin. Tuberculous, nontuberculous infected, cirrhotic and cardiac effusions are responsible for a small percentage.

The total white-cell count is above 1000 per cubic millimeter three times as frequently in infected as in noninfected fluids from both the pleural and peritoneal cavities. Neoplastic fluids have a white-cell count above 1000 in 50 per cent of the cases.

The protein content of effusions contributes no more than does the specific gravity to the diagnosis.

The differential white-cell count is of little diagnostic value except in differentiating nontuberculous infections.

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PRURITUS ANI: THE ETIOLOGIC FACTORS AND TREATMENT IN 100 CASES*

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INTENSE itching at the anus, pruritus ani, is a condition having specific characteristic symptoms despite multiple causes. It is chiefly because of this confusion between the symptom and its numerous origins that great dissension has resulted in its management. Scarborough[1] reviewed the literature of pruritus ani and found etiologic theories that included such widely divergent concepts as inheritance of neurologic characteristics, outlets for emotional stress, pyorrhea and foci of infection in the teeth and tonsils. Many constitutional conditions, such as hepatitis, pancreatitis, diabetes, tuberculosis and senility, are occasionally associated with generalized pruritus. Anal itching, when it occurs in these conditions, is rarely an outstanding symptom. Anal pruritus has been attributed to a reflex effect secondary to pathologic lesions in distant visceral organs such as the kidney, gall bladder, appendix and prostate. It is fanciful to accept this theory, because existing evidence is insufficient to explain the etiology of severe pruritus ani on this basis.

In practice, most patients who present themselves with pruritus ani as the chief complaint have had the condition for a protracted time, have run the gamut of numerous home remedies, salves and suppositories, and have been treated with various medical, physical and surgical measures. Seventeen patients in this series had had severe pruritus ani from ten to forty years. In reviewing the history of these sufferers, it is remarkable that after an interval of freedom from itching following some presumably specific form of treatment, — x-ray, nerve block or surgery, — symptoms again ensued. There have been recurrences and periods of freedom from symptoms in all patients studied in this series, irrespective of the specific therapy used. The proponents of nerve block by injection of alcohol (Stone[2]) and of oil-soluble anesthetics (Yeomans, Gorsch and Mathesheimer[3]) make no claim for permanence of relief. Although remission of symptoms has occurred after roentgen-ray therapy, recurrence in severe cases has constantly taken place. Nerve section by various undercutting operations also afforded only temporary respite, because in all such cases in this series pruritus recurred. A number of the patients had had hemorrhoidectomies, excision of tags, cryptectomies and papillectomies; despite these plastic procedures, recurrences brought the patient again to seek relief for intractable itching.

Thus it is seen that despite the various treatments in this series, none resulted universally in permanent cure. So far as can be determined from the literature, no author is confident enough to report successfully maintained cures in all cases

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treated by his method, although Hollander[4] has recently reported successful treatment in a small series of patients with severe pruritus ani by tattooing the involved perianal skin with cinnabar (mercuric sulfide), and Manheim,[5] after using a similar technic, has confirmed the immediate success of this method.

An obvious factor, which is constantly present and is mentioned only casually by all authors, is that of anal hygiene and cleanliness. Contamination of the anus and perianal skin by feces after defecation is constantly present in all patients, and is also the one factor that persists after medical, physical or surgical treatment of pruritus ani.

Tucker and Hellwig[6] in a very significant study emphasized the importance of feces in pruritus ani. They studied specimens removed at biopsy from 43 cases in various stages of the disease and classified associated skin lesions in four degrees of severity, that is, exudative inflammation, epidermoid proliferation, atrophy of the epidermis and sebaceous glands, and epithelial defects. These authors comment on the similarity of the histologic picture seen in the first two stages of pruritus ani and the pathologic lesions of the skin in cases of chemical dermatitis. They state that the "hydrops of the epidermis cells, irregular proliferation of the stratum mucosum and of the hair follicles, hyperkeratosis with plugging of the hair follicles and atrophy of the sebaceous glands [seen in pruritus ani], are changes characteristic of dermatitis due to chemical irritants." Of the 43 cases examined by them, none showed changes attributable to allergy or neurogenic factors. Furthermore, biopsied specimens from the anal canals showed no pathologic lesions and were similar in appearance to the histologic picture of specimens from the anal canal in 343 patients without pruritus ani. Tucker and Hellwig argue from this that though anal and rectal disease may exist in patients with pruritus ani, the anal lesion per se is not the essential cause of the pruritus. They conclude that pruritus ani seems to be a simple chemical dermatitis due to "something" in the feces, and suggest as the irritant skatole or some similar decomposition products of proteins. This theory is well in accord with the clinical experience of all observers. With careful anal cleanliness, that is, keeping the perianal skin free of feces, most patients with mild pruritus ani can keep free of symptoms.

According to Caskey,[7] a number of patients present themselves with lesions of the perianal skin that are definite dermatologic entities. The most frequent of these conditions are the mycotic lesions evidenced by a sodden epidermal circle extending outward from the anus and often upward between the gluteal folds. Because of secondary bacterial contamination, it is extremely difficult to culture the fungus. Castellani,[8] in a carefully studied series of patients with pruritus ani extending over thirteen years, was able to demonstrate epidermophytons in 20 per cent. Terrell and Shaw[9] report similar results. Patients with perianal skin lesions due to fungous infections frequently have associated mycotic interdigital lesions, tinea cruris of the groin or phytid eczematoid lesions on the hands. Lichen planus can occur in the perianal region, and is distinguished by violaceous patches made up of smaller individual polyangular flat-topped lesions with little or no pruritus. One such case was treated unsuccessfully by injections and this was followed by hemorrhoidectomy, presumably for pruritus ani. The perianal lesions of lichen planus yield promptly to roentgen-ray therapy.

Psoriasis occasionally occurs in the perianal region and presents a sodden beefy appearance. In these cases diagnosis is clarified by typical psoriatic lesions elsewhere. Circumscribed neurodermatitis may appear in the anal region, and is characterized by a dry lichenified infiltrated lesion. It is highly resistant to treatment, as is evidenced by a patient in this series who was treated by devious therapeutic measures for three years with no constant remission. Oxyuris (pinworms), a competent cause of anal itching, is seen most frequently in children but occasionally in adults. In this series, oxyuris was the etiologic factor in 1 adult patient, who was treated successfully with hexylresorcinol administered orally and by enemas.

Many authors associate idiopathic pruritus ani with the psychoneuroses. This relation is suggested in the psychoanalytic material of a case reported by Saul,[10] who states: "He occasionally indulged in anal masturbation and stated that he often used pruritus merely as an excuse for his indulgence. The regular recurrence of pruritus when his passive homosexuality was aroused, as well as the analytic material, left no doubt as to the connection. It is of interest that the pruritus was often relieved by a satisfactory defecation." Increasing interest in psychosomatic medicine should make us heedful of pruritus ani as a major symptom in obvious psychoneurotics, and in such patients psychotherapy is indicated if simple medical or surgical treatment fails.

To recapitulate, it seems that physicians do not treat pruritus ani from the etiologic aspect but direct their therapy to the symptom. This is accomplished chiefly by the following means: nerve block — anesthetic ointments, subcutaneous injec-

tion of oil-soluble anesthetics, quinine compounds, distilled water, hydrochloric acid and alcohol, undercutting operations and roentgen-ray therapy; excision of anal lesions — internal and external hemorrhoids and skin tags, crypts and papillae, and fissures and fistulas; and biological and chemical therapy — vaccines and tattoo with cinnabar. Such secondary measures as dietary restrictions for possible allergy, general sedatives and anal hygiene are mentioned by most writers.

There is, therefore, no universally adequate treatment for pruritus ani, inasmuch as no common etiology has been accepted. My experience with varied forms of treatment has been that recurrences are frequent, and that occasionally severe complications occur after certain therapeutic measures. Two patients developed perianal abscesses following subcutaneous injection of anesthetic oil solutions, and a severe abscess followed alcohol injection by the Stone technic. These cases required extensive surgical procedures, and convalescence was protracted. Huhner[11] reports 6 cases of azoöspermia following roentgen-ray treatment administered by competent dermatologists for dermatoses of the perineal region. Four of these were known to have had active spermatozoa before treatment. The testicles had evidently been protected, but insufficiently. I have had a similar case. These experiences warn against the use of roentgen ray in the treatment of pruritus ani in fertile men.

As stated, despite the specific measures outlined above, one constant factor is present in all cases of pruritus ani, namely, soiling of the perianal skin with feces. It is probable that in certain atopic patients sensitivity to chemical substances in their own feces by constant contact results in perianal dermatitis, with itching as the chief symptom. Furthermore, the perianal skin is naturally well adapted as a medium for the development of a contact dermatitis, since heat, moisture, skin folds, perspiration and hair are all present. Added to mechanical friction on walking or sitting is the act of using toilet tissue after defecation. This is really tantamount to anointing feces into the perianal skin. Feces contain numerous chemical substances that can act as irritants to the skin. Among these are the bacteria and their exotoxins, intestinal enzymes and even the end results of bacterial action on proteins — the indoles, phenols and skatole. Furthermore, I[12] have shown that indole, skatole and fecal emulsions will produce a dermatitis when applied as a patch test in sensitive persons.

Inflammatory lesions in the anal canal and lower rectum, proctitis, hypertrophied papilla, infected anal crypts, mucosal fissuration, chronic fistula or anal fissure may cause anal pruritus. This results in maceration of the perianal skin by constant soiling with irritating pus and by actual inflammatory changes in the sensory end nerves in hypertrophied papillae and perianal skin. As Scarborough[1] and others have shown, anal lesions must be treated surgically to ensure elimination of such obvious causes of pruritus. Scarborough found local pathologic lesions present in all of 152 cases of pruritus ani. Fifty-two of these were satisfactorily treated by surgical measures, and in this group pruritus did not recur, a perfect result. It must be emphasized, however, as stated by this author, that these findings were reported shortly after operation, and that some late recurrences may be expected.

Perianal skin lesions frequently seen associated with pruritus are due primarily to mechanical abrasions caused by irresistible scratching and subsequent infection. In many patients this is subconscious, occurring during sleep, frequently awakening the patient and preventing further sleep. Occasionally well-defined cellulitus results from this form of induced infection, complicating the treatment of the essential pruritus. Furthermore, this inflammatory skin lesion may be a contributory factor in perianal abscesses occasionally resulting from the subcutaneous injection of alcohol or anesthetic oil.

The concept that patients with obstinate pruritus ani are specifically sensitive to a chemical substance or substances occurring in feces forms the basis of treatment in this report. I believe that this relation exists and is an important causative factor of pruritus in all sensitive cases except those due to mycotic or other specific dermatologic entities. Obviously surgical conditions such as anal ulcer, fissures, fistulas and cryptitis are excepted, as are cases of oxyuris infestation. Excepted also is the occasional patient with a psychoneurotic anal fixation, in whom pruritus ani is a symptom.

In this series a detailed history was obtained especially with regard to previous treatment and length of remission following treatment. General physical examinations, urine analyses and blood serological tests were routinely performed. On rectal examination, inspection of the anal region was considered to be important. Skin lesions were classified arbitrarily on inspection in degrees from normal to third, depending on the severity of the dermatitis. The patient was asked to strain or bear down in order to determine the possible presence of prolapsed mucosa. Careful digital examination demonstrated sphincter tone and palpable pathologic lesions, such as hypertrophied papillae, fissures and

polyps. Sigmoidoscopy was routinely performed to rule out the possibility of lesions high in the rectum and sigmoid. Anoscopic examination is essential. In many patients, the rectal mucosa prolapses into the lumen of the examining instrument. Mucosal prolapse is a vital causative factor in soiling the perianal skin because with sitting, coughing, straining or passing flatus a prolapsing mucosa

TABLE 1. *Data on 100 Patients Referred for Treatment of Severe Pruritus Ani.*

DATA		NO. OF CASES
Sex:		
Male		60
Female		40
Duration:		
Less than 6 mo.		8
6 to 12 mo.		16
1 to 3 yr.		33
3 to 6 yr.		18
6 to 10 yr.		8
10 to 15 yr.		7
Over 15 yr.		10
History:		
Worse at night		73
Worse before or after defecation		43
Specific food allergy		9
Previous therapy:		
Local medication only		76
X-ray		15
Subcutaneous nerve block injections, alcohol, anesthetics, etc.		19
Undercutting operations		4
Hemorrhoidectomy		8
Surgery for fissure		4
Perianal dermatoses:		
Absent		17
Present		83
1st degree (mild)	28	
2nd degree (moderate)	36	
3rd degree (severe)	19	
Anorectal lesions:		
Absent or insignificant		18
Excess skin tags		15
Prolapse of mucosa		42
Moderate or large internal hemorrhoids		27
Hypertr phied papillae		25
Fissuration, anal mucoderm		12
Inflamed crypts		12
Granular proctitis		13
Fissure in ano		3
Disposition:		
Did not return		11
Anal hygiene regimen only		50
Referred for surgical therapy of anorectal lesions		21
Refused surgery, did not return		9
Surgery, followed by anal hygiene		12
Sclerotic injection for internal hemorrhoid or mucosal prolapse, anal hygiene		16
Psychotherapy		4

can extrude rectal mucus or feces through the anal sphincter. Many patients had residual feces in the lower rectum despite the fact that defecation had occurred shortly before examination. This is significant in the causation of pruritus, because many patients have learned by experience that an attack of pruritus can be temporarily abated by a cleansing rectal lavage. Similarly, the presence of large internal hemorrhoids contributes to perianal soiling by partial prolapse through the anus.

Treatment is directed mainly toward keeping the perianal skin free of feces. As pointed out, gross pathologic lesions, redundant rectal mucosa, prolapsing hemorrhoids and hypertrophied papillae favor perianal soiling and must be eliminated by surgery. Secondary skin infections, such as cellulitis, skin and mucosal fissures and abrasions from scratching, must be treated by measures directed toward restitution of a fairly healthy skin. Obvious surgical lesions such as anal ulcer and fistulas, which soil the skin with irritating pus, must be adequately excised.

Table 1 gives an analysis of one hundred patients with pruritus ani seen in the proctological clinics of the New York and French hospitals. The material varied from relatively mild cases of short duration to very severe, almost intractable lesions.

In the routine treatment of these cases it is explained to the patient that there is a direct relation between perianal soiling with feces and the itching. Furthermore, it is emphasized that successful treatment depends on the patient's careful co-operation in following instructions, and responsibility for success or failure of treatment is thereby placed squarely on him. Instructions in the care of the perianal region are carefully explained, and the following written directions are given to him:

> After defecation whenever possible take a rectal enema, using a pint of plain warm tap water. Expel this immediately. A convenient method is through the use of a rubber hand syringe. Cleanse the perianal skin with wet absorbent cotton. Do not use toilet tissue. Dry well with cotton and powder well with cornstarch or talcum. Cleansing with wet cotton and dusting with powder must be repeated about four times daily, depending on the amount of moisture and the degree of itching. Always keep the skin around anus clean and dry. Carry cotton and talcum in separate envelopes on the person in a pocket or handbag. Before retiring repeat rectal lavage, and cleanse, dry and powder the anal region. After retiring rub a small amount of ointment well into the perianal skin. This may cause burning for several minutes.

Rectal lavage is directed toward removing residual feces from the lower rectum and anus after defecation and is advised before retiring, because in many patients the itch is intensified at night. Through the day feces may accumulate in the lower rectum, and their removal before retiring frequently prevents nocturnal itching. Mineral oil is interdicted in our patients because we have found that oil stained with feces frequently leaks through the anus to soil the perianal skin.

Half-strength Whitfield's ointment is used routinely:

Salicylic acid	1.0 gm.
Benzoic acid	2.0 gm.
Petrolatum	30.0 gm.

This can be modified by adding a small quantity of menthol. This preparation is used for two reasons. In the first place, mycotic infections, primary or secondary, are associated with pruritus ani in about 20 per cent of all patients (Castellani[8]), although it is difficult to demonstrate the specific fungus. It is advisable therefore, to employ empirically an antimycotic medication such as Whitfield's ointment. Secondly, this ointment applied to the perianal skin causes moderately severe burning for about ten minutes. This burning is accepted subjectively as far more satisfactory than the usual intolerable itching that plagues the patient after retiring, and, in addition, the necessity for scratching is removed. Further abrasions and reinfection of the perianal skin are thus prevented, the vicious circle is broken, and the excoriated and infected skin tends to heal rapidly.

Patients with second-degree or third-degree perianal lesions, that is those with edematous, inflamed and excoriated skin, and those with localized cellulitis, are treated with applications of wet dressings. The dressings are applied overnight by means of a perineal pad under a T binder; in very severe cases, bed rest for several days, with constant wet dressings, is advised. Hamamelis and tap water are utilized. Treatment with ointment is withheld until the condition of the skin has improved, but rectal lavage and perianal cleansing are used as described.

Associated pathologic lesions in the lower rectum and anus are treated surgically, either by operation or by injection of sclerosing solutions when indicated in cases of redundant mucosa or internal hemorrhoids. Treatment with anal hygiene, lavage and ointment is utilized throughout the period of surgical therapy and maintained thereafter.

TABLE 2. *Results of Therapy.*

RESULT	NO. OF CASES	PER CENT
Follow-up 2 months or less		
Failure	3	4
Poor	2	3
Good	16	20
Excellent	59	73
Total	80	
Follow-up 6 months or more		
Well	10	20
Recurrence with careless treatment	26	52
Recurrence with cessation of treatment	14	28
Total	50	

It has been our experience that with clinical improvement patients voluntarily desist from rigid treatment, so that periods of cleansing through the day become less and rectal lavages are discontinued. Table 2 shows that recurrences appeared in most of the patients soon after cessation of treatment or because of careless treatment.

Follow-up data were secured at re-examination from six to twelve months after the first visit. The results of this routine treatment are based on the report of patients as to their subjective symptoms, that is, itching, exudate, burning and pain. Of 100 patients, 20 did not return after the first visit, or refused surgery for anorectal lesions. Of the remaining 80 patients, 20 per cent reported fair improvement after several weeks under routine management, and 73 per cent reported excellent results, a total of 93 per cent in whom management by this means resulted satisfactorily. The best results were obtained in the more co-operative patients regardless of the amount of skin change or the duration of the disease. Of 50 patients who were followed after six months, forty (80 per cent) reported recurrence of pruritus on cessation of treatment, or after an interval of careless treatment. Only 10 patients remained well. These figures confirm the relation of perianal soiling with feces to pruritus ani.

SUMMARY

Pruritus ani is a symptom resulting from numerous causes, some of them obscure. Obvious causes are dermatologic entities, that is, mycotic infections, neurodermatitis, lichen planus, psoriasis, oxyuris infestations and psychoneurosis with anal fixation. Pathologic lesions in the lower rectum or anus are responsible wholly or in part for pruritus ani. Among these are redundant prolapsing rectal mucosa, internal hemorrhoids, proctitis, hypertrophied papillae, cryptitis, fissures and fistulas. These conditions when found must be eliminated surgically. The concept of pruritus ani as a reflex symptom due to disease in a distant organ is untenable, because it is not supported by satisfactory clinical evidence.

In many cases there appears to be a direct relation between fecal soiling of the perianal skin and the presence of pruritus ani. This is evidenced as a dermatosis induced in the perianal skin by irritant substances in the feces of specifically sensitive (atopic) patients. Evidence favoring this concept exists in studies of the involved skin, which show changes similar to those found in other types of chemical dermatoses. Positive patch-test reactions to solutions of indole, skatole and fecal emulsions obtained in some patients with active pruritus ani are further evidence in regard to etiology. It seems likely that constant soiling of the perianal skin with feces is responsible for the recurrences which are so frequent after symptomatic treatment, such as sensory-nerve block by injections

of alcohol or anesthetic oils, roentgen-ray therapy and undercutting operations.

Based on this concept, a routine of management by anal hygiene and medication was instituted in 100 patients with severe pruritus ani. This simple routine of treatment directed toward preventing fecal perianal soiling resulted in subjective and objective improvement ranging from good to excellent in 93 per cent of the 80 patients who followed directions. That fecal soiling is a great factor in the causation of pruritus ani is borne out by the fact that 80 per cent of these patients reported recurrence after an interval of careless anal hygiene or after cessation of treatment.

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REPORT ON MEDICAL PROGRESS

ABORTION

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AN abortion is the termination of a pregnancy before extramaternal viability of the fetus is possible. Until the value to the premature baby of undisturbed comfort in a moist oxygenated, heated atmosphere and of frequent effortless feedings of small amounts of properly fortified liquids was realized, the accepted age of viability was seven months. Now that these advantages are available, it is nearer six months. Arbitrarily, then, if the conceptus dies or is extruded before the twenty-sixth week of gestation, it is considered an abortus. The word, miscarriage, really has the same meaning as abortion, and is properly used in its place, though lay usage often limits the term to abortions that are at least thought to be spontaneous in origin. Conversely it is not proper to interpret the word abortion as signifying willful interference with the pregnancy. Few medical men nowadays give the two words, abortion and miscarriage, any time significance. The extrusion of an abortus may be called either an abortion or a miscarriage, whether at the second or the twenty-sixth week of gestation.

FREQUENCY

In 1934, Kopp[1] reported that among 10,000 applicants to the birth-control clinics in New York, it was found that 29 per cent of the pregnancies were terminated before viability, either spontaneously or by design: 1.0 abortion for every 2.5 productive confinements. Taussig[2] in 1931 had concluded that abortion in the United States was even more frequent than this startling estimate indicates. He computed an incidence of 31 per cent, or 1.0 abortion for every 2.3 pregnancies. In 1925, Macomber[3] reported an abortion rate of only 22 per cent. Among the combined cases of Taussig and Macomber the frequency was 27 per cent. In 1938, Wiehl[4] discovered that only 12 to 17 per cent of pregnancies were aborted. This information, however, was gathered by investigators who, uninvited, visited homes in a sample community selected for a morbidity survey. It appears that perhaps all the abortions were not frankly reported, and that the more willingly given statistics are more dependable. In 1935, Stix,[5] from information given by almost 1000 patients in a New York birth-control clinic, found like Kopp that 30 per cent of pregnancies ended in abortion, stillbirth or ectopic disasters. The German National Bureau of Statistics[6] reported that in 1935, 22 per cent of 300,000 hospitalized obstetric cases were abortions. How many others aborted in private is conjectural — doubtless many more than were delivered at term in homes. It is apparent that an abortion rate of 25 per cent of pregnancies is a conservative estimate.

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Induced Abortions

If 1 out of every 4 pregnancies fails, how many do so spontaneously, and how many are induced? Hamilton[7] found that among 537 cases of abortion admitted to Bellevue Hospital, New York City, only 29 per cent were clearly spontaneous, although another 29 per cent were claimed to be, but were doubtfully so. Kopp, Stix and Taussig, and to some extent, Hamilton, justify the conclusion that about two thirds of abortions are induced. This means that about 16 per cent of pregnancies are willfully destroyed, and about 8 per cent are spontaneously aborted. Taussig[8] quotes Plass as learning from 81 physicians in Iowa and its environs that not quite 5 per cent of pregnancies are terminated by physicians for true therapeutic reasons. From the German report already mentioned, only 0.5 per cent of 16,000 abortions were therapeutic.

Order of Pregnancies

The outrageous — or pitiable — frequency of criminal abortion makes it almost impossible to identify many of the factors of spontaneous abortion. Considering the actual causes, as I shall discuss them hereafter, it seems likely that any conceptus is but slightly, if at all, influenced by its position in a sequence of pregnancies, although the common clinical opinion is that first pregnancies are more vulnerable. To be sure, such mishaps receive undue attention.

Age of the Mother

The order of the pregnancy may not make much difference, but the age of the mother doubtless does; early miscarriage is more likely to occur in women over forty, whose endocrine balance is not as it was, and whose reproductive organs are thus not so well supported and nourished as they were before the early twilight of the menopause.

Age of Pregnancy

The transformation of a conceptus into an abortus by death or disability of all or significant parts of the organism usually precedes the attempt by the uterus to expel its useless contents by at least two, and usually by about six, weeks. When does the abortion take place? For obvious practical reasons, one must date it by the actual extrusion of most of the products of conception. Even on this basis, somewhat more than 80 per cent occur before the completion of the fourth month of gestation, most of them before the third.

Etiology

Intraovular Causes

Continuation of the careful study of aborted material started in this country, by Mall,[9] and carried on notably by Meyer and Streeter at the Carnegie Institution, and by Hertig[10] and his associates in Boston, has shown quite clearly that at least half the abortions, doubtless including even some that were induced, were made inevitable by critical deviations from normal growth of various structures at different times in the period from nidation to expulsion. There is some difference of opinion as to how frequently the observed pathologic change is due to a completely intraovular defect, by reason of abnormality in the germ plasm of either gamete, and how often it is due to interference with normal growth by maternal insufficiency of nourishment at critical stages in the development of vital tissues — perhaps of the nervous or the vascular systems. Mall[9] leaned heavily to the latter explanation. Later studies in genetics[11–17] show quite clearly the possibility of monstrous growth from imperfect genes, a hypothesis further strengthened by the repetition of similarly defective abortuses from an individual woman.[10]

It may be said, then, that the primary cause of 50 per cent of spontaneous abortions is defective development of the embryo proper or of its envelopes, amnion and chorion, and that these defects are largely due to intrinsic genes of ovum or spermatozoon. The other half of abortions and, according to Mall, many of the first half already discussed, must be attributed to deficiencies in maternal nourishment and protection.

Extrinsic Maternal Causes

Properly speaking, any factor but radiant energy to affect the conceptus must first influence some organ or tissue of the mother; but because many traditional causes are primarily maternal, such as systemic diseases and endocrine dystrophies, it is customary to divide the extraovular causes of abortion into "extrinsic maternal" and "intrinsic maternal." Among the former are the following physical and chemical agents. *Radiation,* whether by x-ray or radium, in any amount greater than that needed for limited roentgenography, exposes the fetus to danger, for its nervous and vascular systems are peculiarly susceptible to the rays, indeed so much so that this means is proposed as helpfully abortifacient for therapeutic purposes.[18] *Electricity* is a rare cause of abortion, but a potent one if a shocking current such as that from lightning is suffered.[8] *Lead* passes through the placental filter into the fetal circulation and poisons

the conceptus. It more commonly causes abortion by first affecting either the ovum or more especially the spermatozoon, so that a primarily defective zygote results, that is, one that is incapable of growing to maturity.[19, 20] *Alcohol* does little damage except so far as it disturbs the appetite and digestion and diminishes the general health of the mother and consequently the food quality of her blood.[21, 22] *Nicotine* causes nausea before the mother can absorb enough by smoking to affect the sensitive neurovascular system of the fetus.[23]

Ether or *chloroform* in excess may seriously damage the fetal respiratory or vasomotor centers respectively, but only after endangering the mother, which competent administration prevents. *Quinine,* although it possesses an oxytocic quality and is potentially deafening to the older fetus, has not been shown to precipitate abortion. On the other hand, in malaria, quinine is strongly indicated, for the plasmodia are known to accumulate in the maternal side of the placenta to the serious detriment of the fetus.[24]

Trauma, which includes surgical procedures and coitus, is doubtless the most commonly mistaken of all the possible causes of abortion. Although often an antecedent, it can usually be excluded as a cause by careful examination of the products, which will be found to be pathologic in fully half the cases. To be actually effective, the trauma must truly institute one or more of the following factors: disturbance of the choriodecidual relation; interference with the uterine blood supply to the nidatory site; damage to membranes; serious injury to the very young corpus luteum; activation of the neuromuscular mechanism of uterine evacuation by local irritation or by cerebral disturbance. A local blow that actually injures the uterus or its major vessels or the force of which is transmitted to the placenta or an accurately directed attack on the membranes is required for traumatic abortion. By these criteria, most of the traditionally listed traumas must be considered as at most only mildly contributory to abortion. The *post hoc* resemblance of causation is made manifest by the common frequency of coitus, or of minor accidents or fright, which is such as to make it unlikely that a miscarriage — as also a fit of indigestion — could often occur without any time reference to some incidentally preceding event. This common fallacy of etiologic trauma is also discovered by examination of the abortuses, almost all of which are seen to have suffered their lethal damage many days, weeks or sometimes months before the designated injury and subsequent miscarriage occurred.

Intrinsic Maternal Causes

Infections. On the other hand, intrinsic maternal agents, those arising within the mother's body, often effect abortion. Endometritis, rarely, but systemic infection, commonly, are to blame. With influenza, pneumonia and typhoid fever, as with general septicemia and probably with brucellosis,[25] toxicity, anoxemia and fever[26–28] are the proximal damaging factors. In malaria, as has been mentioned, the plasmodia by local accumulation figuratively smother the villi.[24] Tuberculosis[29] and syphilis[30] are not often causes of abortion. Appendicitis, perhaps by toxicity but more likely by peritoneal irritation, may provoke uterine contractions either before or after the operation for relief. Taussig[8] mentions a similar neurogenous effect from urinary infection, as well as from ureteral catheterization.

Debility. Malpas,[31] a careful British observer, asserts that "poor general health" as "manifested by anemia, debility, fatigue and loss of weight" is a common cause among habitual aborters. It is doubtless a major factor in many cases. Heart disease damages the conceptus only when it is severe enough to cause anoxemia.

Malnutrition and avitaminosis. The diet of pregnant women is apparently more important for the conservation of their own health than for that of the fetus. The studies of the blood made by Krebs and Briggs[32] confirm the deductions of Nürnberger[33] in famine countries that the conceptus rarely suffers death from lack of calcium. As regards vitamins, too, one must not be misled by results obtained on laboratory animals under experimental conditions that are very rarely duplicated in human beings. Although alertly mindful of the critical importance of vitamins for the health of the mother, one must not too readily assign to a possible lack of vitamins in the diet the responsibility for abortion. In regard to vitamin E, the artificial absence of which in the diets of guinea pigs and rats causes early intrauterine[34–37] death, one should defer to the authoritative Mason[38] who writes:

> During recent years there has appeared an increasing amount of indirect evidence that a deficiency of vitamin E may be related to certain reproductive disturbances (habitual abortion, exclusive of that due to pathologic states of the uterus) both in man and in domestic animals. However, the wide distribution of vitamin E in the embryo of cereal grains, green vegetables and animal tissues, suggests that a serious deficiency of [vitamin] E is probably of relatively rare occurrence outside the experimental laboratory.

Endocrinopathy. Extensive biological investigations, together with intensive study of embryological material and abortuses, place heavy respon-

sibility on maternal endocrines for the welfare of the very young embryo, and therefore for abortion. The estrogens must condition the tube so that correct peristalsis will ensure transport of the blastocyst — not so rapidly as to deliver it to the uterus before the endometrium is properly prepared, and not so slowly as to delay its arrival on the uterine mucosa until after it needs more than the available tissue juices can give it. By either event, one may readily explain the disastrously abnormal development of the nervous or the vascular system, which is so common and which Mall believed to be due to the great susceptibility of these tissues in their earliest periods to deficiencies of nutriment. In this same category fall inadequacies of the endometrium because of improper estrogen and progestin influence, on which the proliferation and functional activity of this mucosa depend. These two hormones not only evoke the potentiality to bleed which, when fertilization fails, is expressed by the endometrium in menstruation, but also, by a critical proportion between them, keep this bleeding mechanism under control. If, in spite of conception, excessive bleeding into the stroma around the nidatory site occurs, it must do so at first because the corpus luteum, by its progestin, fails to inhibit the activity of the spiral arterioles, and in later stages because a defective trophoblast fails to function similarly. In even the latter event, the first cause may easily be a disturbance of maternal endocrine activity, because of which the young cytotrophoblasts were improperly nourished.

Violent emotions, however, occasionally do precipitate miscarriage. For other, more convincing reasons one may postulate that, in addition to the ovaries, the thyroid and the adrenal glands are implicated in the bleeding mechanism, and that even in the absence of a nervous disturbance, but occasionally excited by it, an intrinsic abnormality in the function of these glands may activate the local hemorrhagic diathesis.

Profound unpleasant emotions such as fear and anger have been shown to increase the secretions of the adrenal medulla so as to cause contraction of the smooth muscles of arterioles elsewhere.[39] Brewer[40, 41] and others have attributed the supply of free blood to the young embryo, at least in part, to controlled alternating spasm and relaxation of the spiral arterioles of the nidatory site. It seems likely that the miscarriages that follow intense nervous shocks are actually caused by their first effect on the chromaffin tissues. Can the anterior lobe of the pituitary gland, from which come stimuli to all the other ductless glands, be involved? It is an attractive theoretical possibility, which, however, lacks adequate experimental support. Nor do the hormones, Pitressin and Pitocin from the posterior lobe of the pituitary gland apparently have any evil effect on the uterus during the first two trimesters of pregnancy, although Pitocin in the last three months may evoke effective contractions.

Uterine deformities. If malformations, malpositions, scars or tumors of the uterus are associated with disturbed vascularity of the organ, nidation may be difficult, and if accomplished it may be imperfect and lead to such abnormal growth as eventuates in early death of the conceptus. Also, although early development may be normal, such uterine derangement may so constrict the growing conceptus as to prevent its normal development and cause its premature extrusion. To irregularity in the conformation of the uterine lining, as well as to variations of nutriciency, have been attributed placental deviations, such as previa, marginata and succenturiata. The first particularly is certainly sometimes, and perhaps often, a cause of early loss of the conceptus.

Paternal Causes

As Williams[25] found in cattle, Young[12] in guinea pigs and Rugh[14] in frogs, so it undoubtedly is true with human beings that defective spermatozoa may inaugurate the growth of a conceptus whose genic destiny it is to die young.

Lead is such a notorious traditional factor that pregnant women still fear the smell of paint. Geneticists[42] suggest that minor degrees of radiation, not sufficient to stop spermatogenesis, may so distort genes as to give to the chromosomes a lethal character. Debilitated bulls frequently sire abortive fetuses.[25] It has not been proved that mentally or physically depleted men do likewise, but the similarity of their semen to that of faulty bulls strongly suggests that it may be true.

Prophylaxis

Reference to the listed causes of abortion will suggest logical means of prophylaxis, some of which, however, are difficult or impossible to attain. It seems obvious that to prevent almost 66 per cent of abortions, — those which are induced, — economic and social and moral conditions must be improved to permit an approximate synchronization of financial security with coital irrepressibility, and that men and women must be taught first properly to evaluate reproduction, and then how harmlessly to avoid it when irremediable conditions so demand.

Against the very common intraovular defects attributable to cacogenic spermatozoa or ova, are eugenics and possibly hygiene. Proper regard to diet, exercise and rest will obviate many of the

intraovular abnormalities that are ascribed to maternal inadequacies.

Against x-rays and radium, all frequently exposed workers, men as well as women, should be protected by adequate screening. The skin of the artisan, especially, must be protected against the absorption of lead. Alcohol, tobacco, anesthetics and other drugs may be used advisedly. Surgery should be avoided when possible, and when inescapable it should be performed with deliberate regard for the sensitivity of the contractile potentiality of the fundus, for the fragility of the membranes and for the weakness of their attachments. Equanimity, even in the presence of apparent disaster, must be cultivated. Coitus should be permitted only if the cervix is safe from strong impact and the fundus is not subjected to pressure.

Curettage affords the most effective attack on the occult endometritis, which some students, notably Mall, believe to be the underlying cause of many monstrous conceptuses that are ejected. If two successive abortions have occurred, even though one or both were followed by curettage, it is advisable to curette before the inception of the next pregnancy. As prophylaxis against any systemic infection, the rules of hygiene should be rigorously followed by all, but especially by women exposed to pregnancy. To dietary inadequacies attention should also be given. A sugar-tolerance test following one abortion may give valuable help toward preventing a second. Vitamins should be given in essence if there is any gastrointestinal disorder, for such might conceivably prevent their extraction from food sources.[43] Milk or its constituents, in addition to vitamin D, are proverbially valuable.

The role of the endocrines in reproductive physiology makes clear their use to safeguard it. Estrogen, in daily doses equivalent to about .03 mg. given orally, will probably not interfere with ovulation as larger doses would, but will act as a tonic to tubes and uterus and may theoretically stimulate the anterior lobe of the pituitary gland to greater production of helpful gonadotropes. Estrogen, given in the last two weeks of a fertile cycle, cannot inhibit ovulation and may favorably condition the tubes and endometrium to support better the young blastocyst. During this phase, as well as periodically during the first three, four or five months of gestation, progesterone in doses about 5 mg. repeated three or four times on alternate days will at least theoretically encourage endometrial support and discourage myometrial activity. That large doses in the early weeks may interfere with the arteriolar supply of blood to the trophoblastic lacunae is a pure hypothesis. With larger doses given after a manifest threat to abort, one must realize the danger of transforming an incomplete abortion into a missed abortion.

Small doses of thyroid held below the symptomatic level have frequently been followed by a successful pregnancy after previous sterility or abortion. To iodine, too, has been attributed success in patients with somewhat elevated basal metabolic rates. There is no dependable evidence that any available preparation of anterior pituitary hormone is of value to human beings, especially for the purpose of instituting or protecting a pregnancy. Nor can the judicious clinician say more for the chorion hormone that is extracted from pregnancy urine. Reports of its use strongly suggest that it is harmless, but do not at all prove its therapeutic value, for they cannot withstand the impartial appraisal applied by the biologist to his experiment with hormones in vivo. The spontaneous cure rate of abortions is high: probably 90 per cent for those diagnosed as threatened; 62 per cent in pregnancies following two previous abortions[31]: and probably nearer 95 per cent for those following only one abortion. A suspected aberration of the adrenal medulla may be made less likely to express itself by quiet living and the equanimity advised above, together, perhaps, with small daily doses of bromides or of one of the milder barbiturates. Sufficient avoidance of physical and mental stimuli in women who are very susceptible to functional weakness of the uterus may even require isolation and rest in bed for weeks or months.

Prophylaxis against hypoplasia is achieved by the administration of estrogen in daily doses and combined with Progestin during the last two weeks of each cycle for several months before conception. If menstruation is disturbed in rhythm or other quality by such medication, the possibility of inhibition of ovulation must be considered; if such inhibition occurs, estrogen must be diminished, especially during the first two weeks of the cycle. In the presence of sterility or following an abortion, a deformed uterus may make corrective surgery advisable.

Process of Abortion

Since the signs and symptoms of abortion are determined by the process, insight into the behavior of abortus and uterus is indispensable to proper treatment. Certain factors affecting the process are recognized. A few of the older and larger abortuses are extruded, as are the fetus and its envelopes, at term; that is, myometrial performance precedes separation of the chorion from decidual contact. In most abortions, however, these events are transposed. Uterine cramps, before the twentieth week

at least, when unaccompanied by bleeding rarely presage miscarriage.

The condition of the products of conception has made it clear that more than half the abortions begin clinically from two to six weeks following the critical ovular catastrophe.[44] If the delay is more than eight weeks, the condition is arbitrarily termed "missed abortion." The degree and extent of the maceration that takes place during the latent period has much to do with the process of final evacuation.

Disruption of the decidua is usually the first event when ejection begins. But during the first three months, and very rarely after that, such tissue destruction may occur only in localized areas, apparently by a persistent menstrual proclivity, without separation of the normal conceptus. Such a condition is not abortion, but is appropriately called "threatened abortion." The discharge of some part of the conceptus, often only the amniotic fluid, may precede or follow the sanguineous demonstration that a large part of the decidua is disintegrated, which means that evacuation of the uterus has begun and its completion is inevitable. Frequently, this proceeds without excessive bleeding because during the delay, which is usually from two to six weeks, between death of the cyema and the beginning of extrusion, coagulation necrosis has sealed many of the decidual vessels. The abortus may appear in toto or in fragments, and there is no fixed order of progression, although with rupture of the sac usually the liquor and fetus precede. Occasionally, the passing of the whole or a part is obstructed in the cervix. During such a delay, and while ineffective contractions persist, profuse bleeding may occur, sufficient even to threaten severe shock. Because of fragmentation and possible obstruction, two details helpful in diagnosis and treatment must not be neglected: every formed particle that comes away should be most carefully recovered and inspected; a vaginal examination should be made promptly and with aseptic precautions. I see no evidence in fact, nor can I accept the theory, that proper examination is in the least likely to stimulate the processes of miscarriage, and I am equally sure that without examination much time and blood may be wasted.

Diagnosis

There are truly only three kinds of abortion: incomplete (and inevitable), complete and missed. A so-called "threatened abortion" is not one until it becomes inevitable, which is not so when there is only moderate flow or rhythmic uterine cramps, or both. A therapeutic abortion, like its criminal counterpart, is peculiar in the process of evacuation and may be at first incomplete or inevitable and later should be complete. The inevitable abortion may not always seem incomplete, for by definition this means that part of the abortus has come away, but it is so in fact, for the amount of blood that bespeaks certain inevitability appears only after extensive separation of the chorion from contact with maternal tissues. The abortion has already started, and will be completed when all contact is severed and the abortus is extruded. The transition from threatened to inevitable abortion is sometimes hard to recognize. When in doubt after examination, which should be made in any event, one should hold to the tentative diagnosis of threatened abortion. It is sometimes surprising how much blood may be lost without lethal separation of the chorion. The completeness of an abortion is certainly attested to only when the whole abortus has been recovered and identified. If these products are lost, the cessation of signs and symptoms, both of abortion and of pregnancy, is the necessary token of completeness.

The diagnosis of missed abortion is made when the outward signs of inevitable abortion have not appeared before the arbitrarily designated period of eight weeks has elapsed, after death of the cyema or cessation of growth.

Treatment

Abortion

The threat of abortion should be combated at the source, but unfortunately this is often obscure. Painful rhythmic contractions mean uterine irritability or excessive stimulus. Sedation with morphine or one of the barbiturates will quell the latter; progesterone in doses of 5 to 10 mg. will depress the former. Flow means disruption of the decidua by interstitial hemorrhages or separation of some of the villi from decidual contact, or both. Interdecidual bleeding during the first six weeks, and perhaps later, is doubtless due to spasm of the spiral arterioles and subsequent relaxation. This spasm may be inhibited by progesterone, again in doses of 5 to 10 mg. prudently repeated at intervals of twenty-four to forty-eight hours until two or three days after all signs have disappeared. Sedation again may be helpful by diminishing activity of the adrenal medulla, which in turn may conceivably be involved in stimulation of the arterioles. Separation of the villi may, it appears, be due to imperfect villi, the contact of which with decidua is not secure, or to excessive pressure of maternal blood in the sinuses wherein the villi lie.

The relief of pelvic congestion by confinement to bed, emptying of the lower bowel and mild sedation is rational treatment.

The attitude toward the incomplete abortion is quite the opposite. The processes of separation and evacuation should be encouraged and supplemented if necessary. Always, examination should precede treatment, for if the cervix is open and part of the abortus lies in the external os, instrumental assistance is easy and very helpful. This examination, however, should be made only after all facilities of place and equipment for handling a hemorrhage have been ensured. The hospital is the most desirable place. Posterior pituitary extract in doses of 2 to 5 mg. given intramuscularly is likely to stimulate effective contractions. Prompt surgical attack, however, is called for if bleeding is profuse, and also if the inevitable process seems to stop before completion. Hemorrhage and sepsis, as well as missed abortion, may be avoided by emptying the uterus of the defunct parasite. If the internal os is sufficiently open, the finger is safer than the curette for stripping the uterine wall; if a curette is used, it should be a large one. Posterior pituitary extract, as well as the alkaloid of ergot, should be used to prevent bleeding, which usually stops when the cavity is clean. A temporary antiseptic pack is sometimes useful if bleeding is free or prolonged.

If the complete abortus has been passed and identified as such, and if bleeding has stopped, as it usually does in such cases, curettage is not necessary. If doubt of completion arises because parts have been lost or slight bleeding persists, light curettage of the whole cavity is usually advisable.

As has been said, abortion may be precipitated by placenta previa. When this occurs before the sixteenth week, the abortus may be fragmented and removed, although the blood loss may be such as to require replacement. When, however, premonitory bleeding occurs at the twentieth week, or later, the case should be treated as one of placenta previa, and the fetus should be delivered by a Braxton-Hicks version, metreurysis or traction on the fetal scalp to tampon the placenta and accomplish slow nontraumatic dilatation of the cervix. Between the sixteenth and the twentieth week, the choice of treatment is determined by the condition of the abortus and of the degree of previa and of dilatation of the cervix.

Missed Abortion

If the latent period between death of the conceptus and evacuation of the uterus exceeds the arbitrary eight weeks, the condition is called missed abortion. Further delay disturbs the mother's endocrine balance and may lead to sepsis or hemorrhage, in addition to the usual malaise. Oxytocics alone are usually futile but may be very helpful in conjunction with a cervical pack or bag. If the fetus has lived for twenty weeks and the cervix is not easily dilatable, a trachelotomy is the preferred method of delivery.

Habitual Abortion

The spontaneous cure-rate among women who have had previous abortions is so high as to mislead the less perspicacious among therapeutists, who will be easily overwhelmed by the already flagged *post hoc* relation between treatment and events. Malpas[31] found that 62 per cent of women who had aborted twice carried the third baby to term without specific treatment, and, similarly, 35 per cent among 25 women who had aborted three times delivered their fourth pregnancies at term. Hence, I believe, comes much of the enthusiasm for corpus-luteum hormone and for vitamin E therapy, neither of which, however, has actually been proved dangerous. Of the former, it should be said that doses of 5 mg. repeated on alternate days may inhibit the uterine contractions ordinarily evoked by death of the fetus and separation of the chorion, so that what might have been a single prompt complete miscarriage may be transformed into one of the long-drawn-out, incomplete variety, or even into a missed abortion. Possibly the greatest good that therapeutics can do for the habitual aborter is rendered during the month of conception rather than afterward. Estrogen in daily doses not exceeding .05 mg. by mouth during the whole cycle, and progesterone in bidaily injections of 5 mg. during the postovulatory phase, will theoretically condition the tubes for proper care and transport of the blastocyst, and the uterus for reception and nourishment of the trophoblast. After nidation has been accomplished, continuation of the progesterone may diminish irritability of the uterus and also any persistent menstrual urge in the spiral arterioles, thus discouraging a tendency to very early abortion. After the first month, the villi are developed and the conceptus is nourished — no longer by a secreting endometrium that depended on progesterone for stimulation, but from the maternal blood that perfuses the villous mass. Repression of the patient's corpus luteum would then suggest that the role of progesterone is over, but it has been shown that the placenta continues to produce a similar, if not an identical substance.[45] Perhaps the nonvillous chorionic membrane that lies in contact with maternal decidua depends thereon for some more direct sustenance than that derived by way of the placenta. Does the chorion supply the progesterone that keeps the maternal decidua functioning to

this end? Until we learn more of the physiology of pregnancy and of the first causes of abortion, it is reasonable to continue to use progesterone during the first half of pregnancy, or longer in some cases, if previous pregnancies have terminated in miscarriage. The great value of physical and mental hygiene should not be overlooked.

Complications

Hemorrhage and sepsis, as in full-term deliveries, are the major complications of abortions. The former may be prevented by prompt examination under proper hospital conditions to make sure that the abortus is not caught in the cervix, and by skilful and rapid separation of what parts are attached and their prompt extraction by curette or forceps. Venoclysis of glucose solution and of blood should always be available and should be utilized freely.

Sepsis usually bespeaks illegal interference of unknown nature and extent and consequently demands the greatest caution. Again, vaginal examination should be made forthwith, for drainage may be impeded by an obstructing abortus, or possibly by a foreign body. In the absence of hemorrhage, while the temperature is 101 or only 100°F. if it has been higher, or if there is pelvic inflammation, the uterus should not be entered by finger or any other instrument beyond the degree required to demonstrate an open cervical canal. Bleeding of dangerous degree, of course, takes precedence over sepsis and may demand removal of the abortus. Otherwise, medical care, including sulfathiazole in doses of 3 gm. daily, while the leukocyte count exceeds 4000, plus fluids and possibly blood intravenously, is indicated. Moderate doses of oxytocics may accelerate the evacuation of the uterus. Surgery is contraindicated until the patient has recovered from sepsis; when necessary, it must be performed with consummate skill and attention to the fact that the septic uterus is perforated with the greatest of ease.

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CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor*

CASE 26511

PRESENTATION OF CASE

A twenty-year-old student entered the hospital complaining of convulsive seizures.

The patient felt perfectly well until six days before admission, when suddenly his right hand and arm began to "tremble." The attack was of very brief duration and was not accompanied by other symptoms. The patient felt well as he went to sleep that night but some time later awoke to find his doctor bending over him and was told that he had had three convulsive seizures. These began in the right hand, spread to the arm and the entire right side of the body and finally became generalized. With the last seizure there was incontinence of urine. On awaking, the patient was nauseated, and vomited. He was admitted to another hospital that morning and in the afternoon had two similar seizures. It was noticed that at the moment the seizures became generalized the patient became unconscious. He had no more convulsive seizures during the five days before admission to this hospital, though he did have attacks of numbness of the right arm and right side of the body, together with weakness of the right arm, without loss of consciousness or convulsive movements. There had been some headaches associated with the seizures before entry, but none since. For the past year he had not done well in his schoolwork, but stated that this was due to lack of application.

The patient had had the usual childhood diseases and a tonsillectomy several years before admission. The family history was noncontributory.

On examination the patient was a fairly well-developed, thin man who answered questions promptly and sensibly. Examination of heart, lungs and abdomen was negative; the blood pressure was 118 systolic, 70 diastolic.

There was no aphasia, nor any difficulty in naming familiar objects. Visual acuity and fields were normal. There was slight, not definitely abnormal, blurring of the nasal margins of the optic disks. The right side of the face was a little less active than the left. One examiner thought that the knee jerk was more active and the abdominal reflexes less active on the left, but three days later another examiner was unable to find any abnormal reflexes. Sensation, including stereognosis, sense of passive movement and two-point discrimination, was normal, with no difference between the two sides, and the neurological examination was negative in other respects.

The temperature, pulse and respirations were normal.

Examination of the urine was negative. Examination of the blood showed a red-cell count of 5,200,000 with a hemoglobin of 16.7 gm. (photoelectric-cell technic), and a white-cell count of 6400 with 68 per cent polymorphonuclears. A blood Hinton test was negative. A lumbar puncture gave an initial pressure of 230 mm. of spinal fluid, and a final pressure of 160 mm. after 10 cc. of clear colorless fluid had been withdrawn. This fluid contained 10 cells per cubic millimeter; 4 were polymorphonuclears and 6 were lymphocytes. It had a total protein of 32 mg. per 100 cc., with a normal gold-sol curve and a negative Wassermann test. These findings were essentially similar to those in the other hospital five days before admission.

X-ray study of the skull, mastoids and sinuses showed a definite prominence of the convolutional markings throughout the skull. The sella turcica was normal in size and shape, and the petrous and sphenoid ridges appeared normal. The pineal gland was at the posterior limits of normal in the lateral view, and in the posteroanterior view it was slightly displaced to the right. There were several areas of calcification on the left side, close to the midline, anterior to and above the pineal body.

An electroencephalographic recording revealed groups of abnormal six-cycle and four-cycle waves coming chiefly from the left frontal region.

Observation added little to the findings. The patient stated that occasionally he was unable to remember names and had difficulty in pronouncing long words, although nothing of the sort was actually observed by others and he had no difficulty in naming familiar objects or in reading or writing. The attacks of numbness in his right arm became less frequent. One attack, lasting three or four minutes, occurred while he was writing, and he found that he was unable to control movements of the right arm properly, but that he could move the arm. Headache did not recur. On the eleventh hospital day a ventriculogram showed a large mass between the cerebral hemispheres, projecting both to the right and to the left and almost obliterating the middle third of the left lateral ventricle. It was reported to have a sharply defined margin, which was slightly lobulated in its lower posterior portion. Areas of

calcification lay in the posterior portion of the mass.

An exploratory craniotomy was performed on the eleventh day.

Differential Diagnosis

Dr. James B. Ayer: We are here confronted with initial symptoms of Jacksonian epilepsy, limited at first to the right hand and arm, with subsequent attacks of numbness of the whole right side of the body. The convulsive seizures were followed by loss of consciousness. The attacks of numbness were without accompanying mental impairment. Evidence for a suspected expanding lesion of the brain is at first very slight — minimal headache and slight, "not definitely abnormal" blurring of optic disks. Vomiting is not mentioned. However, when we add the evidence of the simple skull films showing prominence of the convolutional markings and the finding on lumbar puncture of a moderately elevated spinal-fluid pressure, we are entitled to consider that an expanding lesion is quite certain. If our investigation stopped at this point, we should almost surely place the lesion in or near the left frontal region, and in support of this we have the evidence offered by electroencephalography.

But we cannot place the lesion solely in the frontal area in the light of pneumography. This procedure showed a well-defined mass between the cerebral hemispheres, almost obliterating the middle portion of the left lateral ventricle, and displacing the pineal body posteriorly and to the right. Therefore we are forced to consider a mass so placed and to discuss its seat of origin, possible extension and pathologic character. I believe that certain tumors in this region may be excluded because of lack of appropriate symptomatology, that is, tumor of the pineal body, craniopharyngioma and cystic tumors of the ependyma. A mass confined to the left frontal lobe could hardly cause the x-ray picture presented.

Tumors arising in the falx, in the corpus callosum and in the septum pellucidum, including the cavum, may give this x-ray picture. Perhaps we should include an inflammatory mass because of the presence of polymorphonuclear leukocytes reported in the examination of the spinal fluid, but I prefer to regard these cells as arachnoid cells with lobulated nuclei that do resemble polymorphonuclears; a small number of such cells are commonly found in the presence of tumors involving the meninges. Tumors in the situation described cause epilepsy, but usually of a more generalized character, and we expect memory loss, apraxia and aphasia, which are not surely present. Until of considerable size or in such a position as to block the foramen of Monro or the aqueduct, headache need not be excessive. Of the three tumors considered, I should favor a meningioma of the falx, containing calcium deposits, and I suspect that the tumor extends upward on the medial aspect of the hemispheres anteriorly, giving the focal epileptic attacks that first called attention to its presence.

Dr. James R. Lingley: The plain film shows evidence of increased pressure by prominence of the convolutional markings. The pineal body appears to be displaced backward, but on measurement it is at the posterior limits of normal. There are two small flecks of calcification above and anterior to the pineal body. These are rather difficult to see in the anteroposterior view, but stereoscopically one can make them out slightly to the left of the midline. The pineal body in this view is displaced to the right. The tumor, even on the plain films, is localized to a point close to the midline in the left midparietal region. The air studies confirm the findings of the plain film. The tumor extends down between the lateral ventricles and projects more to the left. In the anteroposterior view it appears that air in the left lateral ventricle extends around the lateral margin of the tumor, a large portion of the mass being intraventricular. It arises close to the falx, as Dr. Ayer has stated, and involves both ventricles. It could also arise in the region of the corpus callosum.

Dr. Ayer: I should like to ask Dr. Schwab whether the encephalograms are consistent with a tumor in that region.

Dr. Robert S. Schwab: Yes.

Dr. Augustus S. Rose: Do you think that the age, twenty years, is young for meningioma?

Dr. Ayer: Yes, but it is also young for other forms of tumor. It is hardly a region for cholesteatoma; they usually grow from below upward, and I think Dandy's* case, arising from the fifth ventricle, showed an embryonic type of tumor. It is very rare. I accept your suggestion that the patient is young, but he is also young for glioma.

Dr. James C. White: Epidermoid cyst, a cholesteatoma, is the guess that I should make, because of his being so young.

Dr. Ayer: They arise at the base, do they not?

Dr. White: Yes.

Dr. Ayer: It is a good suggestion and one that we ought to consider — some unusual form of tumor.

*Dandy, W. E.: Congenital cysts of the cavum septi pellucidi (fifth ventricle) and cavum vergae (sixth ventricle): diagnosis and treatment. *Arch. Neurol. & Psychiat.* 25:44-66, 1931.

Clinical Diagnosis

Brain tumor.

Dr. Ayer's Diagnosis

Midline tumor invaginating the third and lateral ventricles by pressure from above, probably a meningioma of the falx.

Anatomical Diagnosis

Cholesteatoma of the third ventricle.

Pathological Discussion

Dr. Charles S. Kubik: A ventriculogram was done, even though the calcium deposits were found by x-ray, because the question of intraventricular hemangioma came up. That is another tumor in which calcium may be found. Another reason for doing it was the apparent discrepancy between Jacksonian seizures beginning in the arm and calcium deposits near the midline of the parietal region. There is a considerable distance between the calcium deposits and the arm area of the motor cortex, and since a rather large tumor may have calcium in only one part of it, it was thought that the possibility of such a tumor's extending outward to the surface had to be considered.

The tumor found at operation was situated between the two hemispheres, where Dr. Ayer placed it. Dr. John S. Hodgson, who did the operation, had to go through the left lateral ventricle to reach it. The tumor was a cholesteatoma or epidermoid cyst. The contents, consisting of characteristic, flaky and cheesy material with a pearly luster, amounting in all to 20 gm., was evacuated and part of the cyst wall removed. There were two or three seizures after the operation, but no paralysis, and after the first few days convalescence was uneventful. The patient seemed to be perfectly well when he was discharged from the hospital.

Cholesteatomas usually occur at the base of the brain in the region of the sella, but may be found in other parts of the cranial cavity. The lining membrane is composed of epidermal epithelium. The other structures of the skin, such as hairs and sebaceous glands, which are seen in ordinary dermoid cysts, are not present. True dermoid cysts containing such structures, of course, may also occur within the cranial cavity. The intracapsular material in a cholesteatoma consists largely of desquamated, degenerated, squamous epithelium, has a pearly luster and, when rubbed between the fingers, feels greasy, or like soap. It contains cholesterin crystals but, unlike a dermoid cyst, no hair or sebaceous material.

Dr. Tracy B. Mallory: Have you any further comment, Dr. Ayer?

Dr. Ayer: Nothing, except that it is a queer place for a cholesteatoma.

Dr. Allen G. Brailey: What is the prognosis?

Dr. Ayer: Fairly good. We have several cases that have been observed for a number of years.

CASE 26512

Presentation of Case

First Admission. A fourteen-year-old schoolboy entered the hospital complaining of headache, nausea and vomiting following a blow on the head.

Sixteen days before admission, the patient was struck in the left occipital region with a thrown baseball and knocked down. If he lost consciousness, it was for only a few seconds. He got up and continued to play but after a few minutes complained of a headache and then began to vomit. He was taken home by his mother, who had been watching the game, and on the way she noticed that he talked vaguely and made irrelevant remarks. The boy was examined carefully by his physician, who found no abnormal physical signs, and x-ray films of the skull taken the next morning were said to be negative. However, headache and vomiting continued intermittently, the headache being especially severe in the morning. Then the headache lessened, and intermittent nausea and vomiting became the most prominent symptoms, usually recurring every other day. Between times he seemed well, was bright and ate heartily, and four days after the accident there were three successive days during which he was completely free from symptoms. Then, during the latter days before entry, drowsiness developed. Three days before admission the patient was examined by a consultant, who noted that the eyegrounds showed definite venous engorgement and a very trifling haziness at the nasal margins, which he considered to be within normal limits. Since the injury, the systolic blood pressure had averaged 118, with a diastolic between 65 and 50; the pulse rate had been between 50 and 60.

In the past the patient had had a tonsillectomy, appendectomy and mastoidectomy at unstated periods before admission. The family history was irrelevant.

On examination the patient was a well-orientated, alert, co-operative boy who did not appear ill. There was an old mastoidectomy scar behind the right ear. Examination of the heart and lungs was negative; the blood pressure was 110 systolic, 55 diastolic. Examination of the abdomen was negative except for an old appendectomy scar in

the right lower quadrant. The only positive neurological findings were a slight right facial weakness and an indeterminate right plantar reflex. The optic disks were hazier than they had been three days previously. One examiner believed that the right abdominal reflexes were less active than the left.

The temperature was 98.8°F., the pulse 56, and the respirations 20.

Examination of the urine was negative. A blood Hinton test was negative. Lumbar puncture gave an initial pressure of 230 mm. of spinal fluid; the total protein was normal (24 mg. per 100 cc.), the Wassermann test was negative, and the fluid was normal in other respects.

On the day of admission a bilateral subtemporal craniotomy was performed. The brain bulged into the wound on both sides. A considerable amount of blood-stained subdural fluid and a large amount of blood-stained subarachnoid fluid were evacuated from both sides, although there was a greater quantity of both subdural and subarachnoid fluid on the left. After removal of the fluid the brain fell back, but not so much as is usual. It was noted that the veins in the left Sylvian fissure were very large and tortuous and that one of them ran backward low down across the temporal pole. Drains were placed in both wounds, which were closed in layers with silk.

Postoperatively the patient was given 5 per cent glucose intravenously and was comfortable except for some slight vomiting. The operative wound remained clean and gradually healed while draining blood-stained fluid. The pulse remained between 50 and 70 during hospitalization, and the temperature, after an immediate postoperative rise to 100.6°F., fell to normal in three days. Five days after the operation he became less active, but not drowsy, and complained of a headache that was slightly more pronounced on the left side. Examination of the fundi showed the same blurring of the nasal margins of the optic disks that was noted preoperatively and absence of physiological cupping in the left disk. The arm jerk was thought to be a trifle more active on the right. A lumbar puncture at this time gave an initial pressure of 250 mm. of spinal fluid and a final pressure of 150 mm. after the removal of 10 cc. of clear, colorless fluid. This fluid contained no cells and had a protein content of 24 mg. per 100 cc. Another puncture three days later gave an initial pressure of 220 mm.; the fluid contained two cells and had a total protein content of 19 mg. per 100 cc. This same day, immediately after sneezing, the patient had a feeling of something giving way in his forehead in the mid-frontal region: "It clicked, and after this my head felt free and the foggy feeling disappeared." The patient was discharged on the eighteenth postoperative day, apparently relieved.

Second Admission (three weeks later). The patient had remained well until early in the morning four days before admission, when his mother saw him have a convulsion, but was unable to describe its characteristics. She summoned her physician, and within the next two hours the patient had two more convulsive seizures, each lasting one to three minutes and accompanied by loss of consciousness. The attacks began with the head turning to the right, followed by twitching of the right arm and leg and incontinence of urine. There were residual dullness, stupor, and vomiting of greenish-yellow material, and the patient complained of a frontal headache behind and above his eyes.

Neurological examination was negative except for bilateral pulsating decompression scars over the recently made burr holes, with audible systolic bruits over both. The blood pressure was 95 systolic, 60 diastolic.

The temperature and respirations were normal; the pulse was 60.

A lumbar puncture gave an initial pressure of 190 mm. of spinal fluid, with a final pressure of 170 mm. after 6 cc. of clear, colorless fluid had been removed. No cells were found in the fluid, which had a total protein of 33 mg. per 100 cc.

X-ray films of the skull were negative except for the operative defects made at the previous entry. Three electroencephalographic recordings showed an area of abnormal functioning cortex in the left frontal region extending backward to the motor area. The right side and the left side posteriorly were affected hardly at all. With mild overbreathing, the abnormality on the left side greatly increased, and finally, toward the end of overbreathing, extended to include the right side. With return to normal ventilation, the right side quickly returned to normal limits, whereas the left side remained abnormal.

An operation was performed on the ninth hospital day.

Differential Diagnosis

Dr. Jost Michelsen: The first part of this story sounds familiar. This boy received an injury to his head. Immediately following this injury there was brief unconsciousness, and after he came to, headache, vomiting and impairment of mental functions. No abnormalities were found on examination. This is the picture of a concussion or contusion of the brain, and one would expect

improvement after a few days. But the headache and vomiting continued, the headache becoming particularly severe in the morning, and drowsiness eventually developed. Both the morning headache and the drowsiness suggest that the brain lesion was not a simple concussion or contusion. Headache in the morning is characteristic of increased intracranial pressure, and the drowsiness confirms the assumption that the patient had a traumatic lesion which led to increased intracranial pressure. Why the headaches varied from day to day without apparent reason, I cannot explain, but we observe this frequently in such cases.

The findings on examination in the hospital gave some additional evidence of the increased intracranial pressure, the spinal-fluid pressure of 230 mm. being definitely abnormal. One posttraumatic lesion that would fit into the picture presented so far is an acute subdural hematoma. There are two types of posttraumatic acute subdural hematomas: one, which I should call the primary, confined to the subdural space and due to rupture of the so-called "bridging veins," and the other, the secondary, due to a contusion or laceration of the brain with subarachnoid hemorrhage that extends into the subdural space through the torn arachnoid membrane. The absence of red cells or xanthochromia in the spinal fluid is in favor of a primary subdural hematoma, but the findings at operation are not in accord with this conclusion. Blood-stained subarachnoid fluid, as well as blood-stained subdural fluid, was observed. This suggests that there was a subarachnoid hemorrhage with secondary extension into the subdural space.

The question now arises as to what this subarachnoid hemorrhage was due. Perhaps it was caused by a contusion of the brain. Since the occiput was hit, we might expect a *contrecoup* effect on the frontal lobe. The slight neurological signs — right facial weakness and right-sided reflex changes — could go with that. But there are other questions perhaps more important. Why did the brain not fall back after successful removal of the hematoma? Why was the fluid still blood-stained after sixteen days? Usually after the fifth day a spinal fluid that has contained blood clears, becomes xanthochromic and finally colorless. And how should we account for the enlargement and tortuosity of the middle cerebral veins? I shall try to answer some of these questions later on.

The recovery of the patient after the operation was not so prompt as we should expect. But this is not very unusual. Occasionally subjective and objective signs improve very slowly postoperatively. Quite unusual, however, it seems to me, is the miracle that happened on the eighth day, when the patient sneezed and said, "It clicked, and after this my head felt free and the foggy feeling disappeared." I spent considerable time wondering about this dramatic turn of events. Sneezing increases the intracranial pressure and, even more, the pressure in the accessory sinuses of the nose. It is known to be an etiologic factor in the formation of so-called "aerocele" in posttraumatic cases.

The patient was back in the hospital three weeks later. This time the neurological examination was negative except that the pressure was still high, and that a new symptom had appeared. Four days before admission the boy had three epileptic attacks. They were of a focal character, the head turning to the right, followed by twitching of the right arm and leg and then by unconsciousness and incontinence of urine.

The electroencephalograms pointed toward the left frontal region. Clinically, the focus should have been fairly high up toward the midline anterior to the central gyrus.

Focal and generalized epileptic attacks after an injury to the brain are by no means uncommon. The period between the injury and the onset of fits is variable. There are early attacks immediately following the injury; in other cases they may develop within a month or two, or even many years later. Scar formation and atrophy of the brain are etiologic factors. But I hesitate to consider this epileptic syndrome as one of the common sequelae of a head injury. One must remember that the spinal-fluid pressure was still high. Furthermore, we are told that systolic bruits were heard over the recently made burr holes. Here we recall the enlarged veins found at operation. This leads to the conclusion that this boy had some sort of vascular abnormality, a lesion that was at least present at the time of the operation or possibly even before he received the trauma.

Vascular abnormalities of the brain vessels frequently cause epilepsy. The bruit at the time of systole might indicate that there was an arteriovenous aneurysm. Posttraumatic arteriovenous aneurysms usually involve the carotid artery and cavernous sinus after fracture of the base of the skull. They give a characteristic syndrome, which is absent here, and they do not produce epilepsy. I know of only one case of a posttraumatic arteriovenous aneurysm of the surface of the brain, which was removed by Penfield.* A venous angioma is

*Elvidge, A. R.: The post-traumatic convulsive and allied states. In *Injuries of the Skull, Brain and Spinal Cord* edited by Samuel Brock. 632 pp. Baltimore: Williams and Wilkins Company, 1940. P. 251.

another possibility. I am unable to make a definite diagnosis.

In conclusion, I should say that this boy had a traumatic lesion of the brain with subarachnoid and subdural hemorrhage followed by focal epilepsy probably associated with a vascular abnormality that was either present before the trauma or developed following it. Although very rare, an arteriovenous aneurysm in the left frontal region seems to be a reasonable bet. The somewhat commoner venous angioma is my second choice.

Stretching my imagination considerably further than I actually should, I might even conceive that the sneezing and the clicking had something to do with the formation of an aneurysm.

Dr. Augustus S. Rose: What about a subdural hematoma under the frontal lobe?

Dr. Michelsen: One thing has to be said definitely: epileptic attacks as a symptom of subdural hematoma are extremely rare. I do not know of any such cases. I have studied the literature a bit and have found that statement everywhere. I therefore eliminated from consideration a recurrence of the subdural hematoma or the possibility that some of the subdural hematoma was not drained. This might be a rare example of such a condition. However, we have not been given many details about the operation — how far down it extended, for instance. Your suggestion that further clot might be present under the frontal lobe is a very good one, because this region cannot be well explored with a subtemporal opening.

Dr. James C. White: We have had at least one or two such cases.

Dr. Michelsen: In the acute stage?

Dr. White: Yes. They were relieved as soon as they were drained.

Where do you find the evidence for the subarachnoid hemorrhage? Was there blood in the spinal taps?

Dr. Tracy B. Mallory: At the operation, blood-stained fluid was found in the subarachnoid space.

Dr. Henry R. Viets: Do you know about the fields of vision?

Dr. Charles S. Kubik: They were normal.

Clinical Diagnosis

Subdural hematoma.

Dr. Michelsen's Diagnoses

Contusion of the brain, with subarachnoid hemorrhage and subdural hematoma.
Arteriovenous aneurysm?
Other angiomatous malformations?

Anatomical Diagnosis

Intradural hematoma beneath left frontal lobe.

Pathological Discussion

Dr. Kubik: This is a difficult case, and it has been made more difficult by a number of "red herrings" in the clinical abstract. These, it should be added, were copied from the record in good faith and were not put in for the purpose of misleading Dr. Michelsen. I should have read the copy more carefully and taken them out, since they were never thought to be important by the clinicians in charge of the patient. Considering the reported finding of a large vein at the first operation and of a bruit at the second admission, Dr. Michelsen had very good reasons for his conclusions.

I agree that bloody subarachnoid fluid, observed at the first operation, is inconsistent with the finding of normal spinal fluid by lumbar puncture before operation. The small amount of blood seen in the subarachnoid space at operation must have been the result of operative trauma.

Dr. W. Jason Mixter ought to be here to tell you what was found at the second operation. At the first operation, burr holes were made in the usual position, and exploration did not include the anterior part of the frontal region. At the second operation, a bone flap was turned down, and an organized hematoma, from 4 to 5 cm. in diameter and from 1 to 2 cm. thick, was found beneath the left frontal lobe, extending nearly to the cribriform plate. This was on the outer surface of the dura and in the dura itself. The inner surface of the dura looked normal, and there was no false membrane such as is found regularly in subdural hematomas of the same age. Most of this was removed, and the boy made a good recovery.

Dr. Michelsen: Seriously, what do you think about the sneeze and the clicking in his head that is given so much space in this report?

Dr. Kubik: I do not think much attention was paid to that, perhaps not so much as should have been. I do not know how to explain it. It should have been left out of the summary.

Dr. Saul Hertz: What happened to the bruit?

Dr. Kubik: I think it was not heard after operation.

Dr. Mallory: Dr. Mixter has had a letter recently from the boy's physician stating that he is well several months postoperatively.

The New England
Journal of Medicine

Formerly the
Boston Medical and Surgical Journal

Established in 1828

OWNED BY THE MASSACHUSETTS MEDICAL SOCIETY AND PUBLISHED UNDER THE JURISDICTION OF THE COMMITTEE ON PUBLICATIONS

Official Organ of
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MATERIAL for early publication should be received not later than noon on Saturday.

THE JOURNAL does not hold itself responsible for statements made by any contributor.

COMMUNICATIONS should be addressed to the *New England Journal of Medicine*, 8 Fenway, Boston, Massachusetts.

AGAIN, CHRISTMAS

As we prepare again, decorously but in a state of mind not entirely free from joyousness, to observe our most significant festival, it might be of value to glance back through the months and recall the spirit in which we passed through the days of the Advent a year ago. The particular Christmas to which we were then looking forward we believed might be the last one worth celebrating for a long time to come. The tidings were of ill omen, and the clouds that hid the future were black.

The democratic way of life was already receiving some severe body blows, not all above the belt, and the future of Christianity or of any ethical system of living looked dark indeed. An evil spirit of unknown power was abroad, and what God had wrought seemed of little value in its path.

Then came days of panic and despair, when everything that we thought of as being right was falling, and faith crumbled. And then came the miracle of Dunkirk when a nation free in spirit arose spontaneously and went across the water and saved from destruction its beleaguered army. That was the sign that was needed, and the turning point of courage, for we knew then that where the vision fails not, the people shall not perish.

There is no question this year of where the earth's free people stand. There is no more panic or despair or fear. There is only a perfectly clear determination that on our continent at least those conditions that have fostered and idealized the spirit of Christmas shall continue to exist.

PREPAREDNESS QUESTIONNAIRES

LAST July the Committee on Medical Preparedness of the American Medical Association mailed 179,796 schedules or questionnaires to all physicians licensed in the United States and the outlying territories. On September 6, 93,437 schedules, or 52.0 per cent, had been returned, the responses varying from 83.2 per cent in Nebraska to 38.5 per cent in New Mexico. The percentage of physicians replying from the First Corps Area, which includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont, was 51.3, a figure slightly lower than that for the country as a whole, whereas the percentage for those in Massachusetts was 52.8, a somewhat higher figure. Although a small number of questionnaires have undoubtedly been received during the last three months, the number of physicians who have not replied has not been materially altered.

The task of securing the balance of the desired information has been turned over to the committees on medical preparedness in the states and territories. In Massachusetts, 3732 physicians have failed to reply, and of this number approximately three fifths are members of the Massachusetts Medical Society. Schedules have been or will be forwarded to the latter by their district medi-

cal societies, and the remainder — all licensed physicians who are not members of the Society — will receive them from the headquarters of the Society.

Just why there has been such a low percentage of returns is difficult to understand — approximately 90 per cent of the physicians in Canada responded to a similar request for information. Of course, the United States is not at war; however, in view of the present emergency and the attempts to prepare this country for any eventuality there seems to be little excuse for ignoring this fact-finding project, voluntarily undertaken by the American Medical Association. The filling-out of the questionnaire is noncommittal; it merely furnishes accurate data that is useful at the moment and would be of extreme value in case of war. It is hoped that the response of the members of the Massachusetts Medical Society will approach 100 per cent!

MEDICAL EPONYM

Fordyce Disease

John A. Fordyce (1858–1925), professor of dermatology and syphilology of the Bellevue Hospital Medical College, New York City, described a peculiar affection of the mucous membrane of the lips and oral cavity in a paper by that title that appeared in the *Journal of Cutaneous and Genito-Urinary Diseases* (14: 413–419, 1896).

> In the autumn of 1895 I presented to the New York Dermatological Society . . . a physician who had consulted me for an affection of the mucous membrane of the lips and oral cavity. The patient's attention was first attracted to the condition about two years ago by a symmetrical fading of the vermilion border of the upper lip, extending from the corners of the mouth almost to the median line, leaving only a narrow margin free next to the skin and a wedge-shaped area in the center of the lip. The two patches were connected at the inferior median line, where the lips come in contact, by a segment of a circle, making three patches, all of uniform color, with well-defined borders and areas slightly elevated. When first noticed the color was but a shade lighter than normal; the appearance otherwise did not seem abnormal, but, by putting the tissues on the stretch, small, irregular, closely aggregated milium-like bodies of a light yellow color just beneath the surface epithelium were plainly visible and completely covered the patches. . . . I report the affection as an example of a mucous-membrane change, which, while apparently not uncommon, has hitherto escaped observation.

R.W.B.

MASSACHUSETTS MEDICAL SOCIETY

SECTION OF OBSTETRICS AND GYNECOLOGY*

Raymond S. Titus, M.D., *Secretary*
330 Dartmouth Street
Boston

Diabetes and Hydramnios as Complications of Pregnancy

Mrs. L., a thirty-eight-year-old para II with diabetes of three years' duration, was first seen in the office on March 18, 1940, when approximately six weeks pregnant.

The family history was noncontributory. The patient's past history included a tonsillectomy and an appendectomy. Diabetes was discovered in the seventh month of the first pregnancy and was controlled with insulin; the pregnancy terminated normally, the baby weighing 9 pounds, 8 ounces. In 1939 a nonmalignant cyst was removed from the left breast. Catamenia began at fourteen, were regular with a twenty-eight-day cycle and lasted four days without pain. The last period began on February 1, making the expected date of confinement November 8.

Physical examination showed a well-developed and well-nourished woman. The weight was 116 pounds. The heart was not enlarged; there were no murmurs. The lungs were clear and resonant; there were no rales. The blood pressure was 130 systolic, 70 diastolic. Vaginal examination showed the cervix posterior and the fundus anterior.

The patient was seen regularly by her obstetrician and a specialist in diabetes. The pregnancy progressed uneventfully until the twentieth week, when the blood-prolan level rose, the highest being 775 rat units per 100 cc. This came down under treatment with stilbesterol and Pregneninolone orally, followed by a period of stilbesterol intramuscularly and by Proluton intramuscularly.

On September 23 the patient was seen in the office. At that time the weight was 142 pounds, and the blood pressure 106 systolic, 60 diastolic. The fundus was 30 cm. above the symphysis, and the vertex was presenting. The fetal heart was audible. Vaginal examination showed the cervix to be soft, not quite flat and not open. It was thought that the patient could be induced within two or three weeks, and she entered the hospital to be under close observation.

Vaginal examination in the hospital on September 30 showed the cervix to admit a fingertip. The

*A series of selected case histories by members of the section will be published weekly. Comments and questions by subscribers are solicited and will be discussed by members of the section.

patient's condition was perfectly satisfactory; the blood pressure was normal, and the urine showed no albumin. She had developed a hydramnios.

On October 6 uterine contractions began but subsided within a few hours. Vaginal examination on October 7 showed the cervix to be soft, practically obliterated and dilated to admit two fingers.

On October 12, when the patient was approximately thirty-seven weeks pregnant, vaginal examination showed the cervix not flat but very soft; the external os was very soft, and the internal os was dilated to admit more than two fingers; the head was high. The membranes were ruptured, with the escape of a large amount of fluid. One minim of posterior pituitary extract was injected, and labor started immediately. Two hours later the injection of another minim of pituitary extract resulted in excellent contractions, and the head came well into the pelvis. Within another two hours a simple forceps operation resulted in the delivery of a male infant weighing 8 pounds, 15 ounces. Both mother and child were in excellent condition.

The mother made an uneventful convalescence, and when seen in the office on November 23, she was very well; the weight was 121 pounds and the blood pressure 110 systolic, 60 diastolic.

Comment. This case illustrates the subsequent course of diabetes mellitus first discovered during pregnancy. That it was true diabetes was evidenced by the facts that it continued after the first delivery and that treatment with insulin was necessary.

The second pregnancy was normal except for a toxemia diagnosed by a high blood prolan. The weight increased from 116 pounds to 142 pounds three weeks before delivery. Vaginal examinations were made the last two weeks before delivery, and labor was induced three weeks before the normal estimated date of confinement, when the cervix was deemed favorable. The reasons for this early delivery were hydramnios, a large baby, the attempt to prevent intrauterine death and a knowledge that many diabetic patients do not go to full term. The mother made an uneventful convalescence, and the baby was normal in all respects.

DEATH

WILLIAMS — FREDERICK H. WILLIAMS, M.D., of Boston, died December 6. He was in his sixty-eighth year.

Dr. Williams was born in Minnesota, where he attended the University of Minnesota, later receiving his degree from the University of the South, Medical Department, Sewanee, Tennessee, in 1901. He did postgraduate work in Berlin, Germany, the New York Post-Graduate School and the London Royal Society. He was on the staffs of the Brooks, Corey Hill and Trumbull hospitals in Brookline. His fellowships included the Massachusetts Medical Society and the American Medical Association.

His widow, a daughter and a son survive him.

MISCELLANY

NOTES

A society of medical officers has been organized at Fort Devens under the name of the Society of the Medical Department Officers of Fort Devens for the purpose of hearing scientific papers. An election of officers was held on October 8. The following were elected: Colonel H. P. Carter, president, and Lieutenant Charles C. Verstandig, secretary-treasurer.

At the weekly meetings, papers have already been presented by Drs. E. A. Adams, Thomas H. Ham, Harry Blotner and S. J. G. Nowak. The meetings are held at the Station Hospital on Tuesday evenings at 7:30 p.m. Refreshments are served.

Medical reserve officers are invited to attend.

At the recent annual meeting of the American Academy of Dermatology and Syphilology, held at Chicago, Dr. John G. Downing, of Boston, was elected vice-president.

CORRESPONDENCE

HOMEOPATHY OVER EIGHTY YEARS AGO

To the Editor: The enclosed letter recently came into my possession and it was such interesting reading, after a lapse of eighty-two years, that I thought you might care to publish it in the *Journal.*

ROBERT D. HILDRETH, M.D.

90 Elm Street,
Westfield, Mass.

* * *

Malden, March 11th/58

Dear Br. H ——,

I received yours of the 8th yesterday and was very glad to hear from old & valued friends. In regard to your medicines those marked with the cypher 0 are all too strong to use. You ought to have ordered the dilutions, instead of tinctures. Most of them should be raised to the *third* dilution before using. This is done as follows. To *1* drop of the tincture add *100* drops of Alcohol, or, taking the common half ounce vial, drop in enough of the tincture to just cover the bottom, then fill it two thirds full of pure Alcohol & shake it well. This makes the 1st dilution. Then drop from this into a clean vial as before & fill up with Alcohol for the 2nd dilution. Then drop from the 2nd into another vial & fill up as before for the 3rd. — The *Acid Sulphur* & *Nitric acid* however, must be prepared, in the 1st dilution with pure rain water, the 2nd with half water & half Alcohol, & the 3rd with pure Alcohol. — Those marked 4 are prepared with water & ought to be diluted once, making the 5th with Alcohol. Those having no mark are probably prepared for use. You can tell by the color. They should all be clear, no color but that of the Alcohol. Some of them are very dangerous in the Strong tinctures, such as Aconite, Belladonna, Conium, Nux vomica, & Helleborus. — To medicate the globules we drop enough of the proper dilution to wet them all, & shake them till all are moistened. You will need to be very careful about *labelling,* & marking the *dilution,* both on the vial & on the cork. Some might be used in acute diseases in the 1st or 2nd dilution, such as Aconite, Ipecac, Hamamelis, Sambucus & Cantha-

ris, but most in the 3rd. We are all pretty well, except my wife has been suffering from a severe cold or Influenza for 2 months or more. My business is very good, and has been all winter. The last week I charged $44. and the week previous $48. And during the year 1857 $1600. But the times are hard here as elsewhere, & money hard to get. We have not had much religious prosperity, or at least not many conversions the last year. But we have the best of preaching, & very good meetings. I feel more at home than I ever did in Westfield, I suppose because I met with so much bitter prejudice there among the members of my own church. Here Homoeopathy stands as high as Allopathy, and though men have their preferences, of course, I do not meet with that bigoted, unreasonable prejudice that I did in W. especially the first year or two. We also enjoy many privileges & conveniences from being near the City. I am glad you have at last got a Homoeopathic physician in W. I hope he will be successful, & give satisfaction. I should be very glad to visit Westfield again, and I ought to do so to attend to some business there, but it is next to impossible for me to get away for a single day. But we are glad you think of coming this way, and we hope we shall not be disappointed of seeing you this Spring. My Wife unites in love to you all, especially to Mrs. H——, whom she hopes to see with you when you come. She will probably go to Westfield in the course of the season if I do not. If you need any further information respecting your medicines or anything else, I hope you will always feel free to write, for I shall always be happy to assist you as far as in my power. Indeed I should be most ungrateful not to do so. And we shall always be very happy to hear from you & yours, and much more so to see you at our house. Br. S—— from your place staid with us night before last or Wed. night. Remember us to all our friends.

Yours Truly
C. W. T——

P. S. The disease you have had in W. which the Drs. have not named, I think from your description may be easily named. I should call it "Cerebro-spinal-arachnitis," or in plain English, an inflammation of the investing *membrane* of the *brain* & *spinal marrow* (the Arachnoid membrane). The disease probably commences about where the spinal cord enters the brain. It sometimes prevails as an Epidemic. The remedies are *Aconite* & *Belladonna* in frequent doses, followed if necessary by *Bryonia* and *Opium* pretty strong.

C. W. T.

SURGICAL INSTRUMENTS FOR ENGLAND

To the Editor: There appeared not long ago in one of the medical publications an appeal for surgical instruments for the American surgeons who are working in England. The request made me sit up and take notice. What medical man has not some old instruments that are not being used, since others have taken their place? Why cannot medical men follow the good example of Uncle Sam? He is supplying battleships to kill Hitlerism. Why cannot we do the same? Not all of us can do surgery; not all of us can leave our families and enlist in the cause of humanity. However, every one of us can find something in our offices that may be of great use to the medical and surgical men and women who are risking their lives by working under all the hazards of shell and fire to save humanity.

The writer is happy to state that he recently delivered to The British War Relief Society at 203 Clarendon Street, Boston, such items as a floor lamp, an irrigator, basins, a desk lamp and various instruments, as well as some ampules of medications.

Let every reader right now — today, not tomorrow — go over carefully all the instruments which are not used in the office. I am sure that thousands of instruments will be found that would be of great use to our colleagues on the other side of the Atlantic, who are jeopardizing their lives for us. By all means let us do our share by showing them that we are with them. At the same time let us do our bit in helping to make this world a safe and sane place for the human race.

William Frankman, M.D.
736 Hancock Street,
Wollaston, Massachusetts.

REPORTS OF MEETINGS

TRUDEAU SOCIETY OF BOSTON

A meeting of the Trudeau Society of Boston was held on October 24, 1940, at the Beth Israel Hospital. Dr. Alton Pope presided. The meeting was addressed by Dr. Richard H. Overholt, who talked on the subject, "The Treatment of Lung Abscess."

In reviewing the literature, the speaker found that the mortality rate for this disease under medical treatment varied from 34 to 75 per cent, the cure rate from 7 to 50 per cent. Combined medical and surgical management showed a 35 per cent mortality and only 50 per cent cures. Surgical management alone was likewise disappointing. To rule out the possibility that the reported hospital cases were poor risks, the results from 100 private cases were gathered from competent clinicians. In this series, there were 31 deaths, and only 49 patients became asymptomatic.

In a recent publication, Dr. Harold Neuhof and his associates reported 104 consecutive cases in which external drainage was provided early in the course of the disease. In this group, there were 4 deaths. The sound pathological and surgical principles on which this excellent work is founded and the superior results obtained led to an adoption of the same course by Dr. Overholt. Since so doing, the mortality in early cases has dropped to 7 per cent, and the cure rate has risen to 93 per cent; thus patients with residual symptoms were eliminated.

The series of 95 cases reported by Dr. Overholt included all types of pulmonary suppuration with cavitation, such as pulmonary gangrene and aputrid and putrid pulmonary abscesses. Excluded were those of a tuberculous nature, those secondary to a pulmonary tumor, or those primarily a part of a generalized pyemia or secondary to an unquestioned bronchiectasis.

Study of the bacteriology of lung abscesses revealed most frequently a mixture of aerobic and anaerobic organisms. The importance of adequate oxygenation in dealing with anaerobes is obvious, and the speaker pointed out the rationale of opening such cavities to the air and the use of oxygen-forming zinc peroxide to change the putrid abscess wall to a healthy granulating surface.

At operation, in practically all cases a mass of semisolid, caseous debris was found filling the abscess cavity. The speaker pointed out the improbability of complete healing of such a process by other than surgical drainage.

Of the 95 cases studied, 91 were found to border on one of the pleural surfaces. Pleural symphysis was found in all but one. The upper posterior portion of the lower lobe was the most frequent location, accounting for almost two thirds of the total. Although a definite cavity could not always be demonstrated roentgenographically, its presence was always confirmed at operation.

Instead of dividing cases into acute and chronic on a chronological basis, Dr. Overholt preferred to classify them into simple and complicated. Simple abscesses included either single or multilocular processes, usually of short duration but without daughter abscesses, surrounding bronchiectasis or marked pulmonary fibrosis. Conversely, complicated cases included those with daughter abscesses, marked bronchiectasis or pulmonary fibrosis.

The safety of surgical drainage is based on two factors, accurate localization and avoidance of traversing the surrounding zone of pneumonitis or neighboring healthy pulmonary tissue. Accurate roentgenological localization is accomplished by obtaining films taken in varying positions. When the surface projection is localized, a few minims of a mixture of carbon and Lipiodol is injected into the overlying intercostal muscle. The Lipiodol can be visualized by roentgenography for confirmation, and the carbon can be seen at operation, thus providing a definite landmark. By such accurate localization, the abscess can be drained without traversing the "danger zone" of surrounding pneumonitis or normal lung parenchyma. In cases in which the danger zone was accidentally invaded, the mortality rate rose from 7 to 27 per cent.

A one-stage drainage is the treatment of choice. Only for those abscesses facing the interlobar fissure or other pleural surface not in contact with the chest wall is a two-stage procedure necessary. The technic consists in making a small incision over the abscess and resection of a short segment of one rib. The subcutaneous fascia and intercostal structures are sewn together to seal off the fascial planes and thus prevent a dissecting infection of the chest wall. Should no pleural adhesions be found, extrapleural dissection is carried out to determine the location, and drainage is through this site. After the presence of pleural symphysis has been determined, positive-pressure oxygen is administered by the anesthetist, and a small opening is made into the abscess. The detritus is removed. The cavity and wound are packed with gauze soaked in zinc peroxide, and the patient is placed on the operated side on the litter. Only then is the positive pressure released. It is believed that the positive pressure tends to keep the lung in apposition with the chest wall and thus prevents tearing the pleural adhesions. It also forces the contents of the cavity toward the outside and prevents spillover infection to the same or contralateral lung.

Since this technic was adopted, the incidence of empyema has been 4 per cent in 43 cases, in contrast to 16 per cent in the former two-stage plan of treatment. Furthermore, there has been no case of cellulitis of the thoracic wall.

In conclusion, Dr. Overholt emphasized the importance of early drainage. Once the diagnosis is established and localization accomplished, nothing will be gained by delay. Procrastination leads to complicated cases with a drop in the cure rate and a rise in the mortality rate. Reports in the literature indicated that of the fatal cases 73 per cent were classed as "frankly hopeless" within the first month. It was also found that in a group of 205 reported cases, the average duration of the disease preoperatively was four hundred and six days. Natural remissions that occur during the course of the disease should not lull the physician into a sense of security, but in the light of recent statistics should lead him to early surgical drainage while an uncomplicated condition exists that can be treated by a method with a low mortality and a high cure rate.

The discussion was opened by Dr. Theodore L. Badger, of the Boston City Hospital, who pointed out that the 30 per cent of lung abscesses that cure themselves spontaneously are the basis for "expectant" medical treatment, which has now become active. In the last two years the cure rate has improved from 3 to 55 per cent by increasing the postural drainage and using chemotherapy in the form of neoarsphenamine, bismuth and sometimes sulfanilamide. By using postural drainage every two hours during the day and every four hours at night there have now been complete cures in 5 consecutive patients. Chemotherapy was the result of a bacteriological study that showed fusospirochetal invasion in all autopsied cases at the Boston City Hospital. These invade much farther than any roentgen evidence demonstrates, and thus may contraindicate surgery. Dr. Badger stated that not all surgeons are competent, and since one can tell in two or three weeks what the medical outcome will be, one is justified in inaugurating this therapy at least temporarily. He stressed the importance of oral hygiene in general, particularly preoperatively, as a preventive measure.

Dr. Henry L. Cabitt, of the Beth Israel Hospital, suggested that lung abscess was a surgical problem like any other abscess. He deplored the fact that only 10 of 72 cases had been treated surgically within six weeks of onset, whereas Dr. Neuhof had operated on 86 of 100, and Dr. Overholt on 50 per cent. He also pointed out that there was a great discrepancy in size between the abscesses that he saw and those described by these workers.

Dr. Donald S. King, of the Massachusetts General Hospital, asked when operation should be carried out on the basis of Graham's description of the formation of a lung abscess, which states that the cavity does not appear for two to six weeks, when a pyogenic membrane is formed. He therefore suggested surgery in five to six weeks if the patient is not improving rapidly on a medical regimen. The large early mortality mentioned by so many observers is often accompanied by widespread pneumonitis when surgery would be of no avail, he claimed.

Dr. John W. Strieder, of the Boston City Hospital, stated that the finding of all types of pathologic processes simultaneously in lung abscess precludes the possibility of classifying this disease according to Dr. Overholt and of treating them all by one method. Of 28 cases in the last two years, he had operated on only 1 in less than eight weeks after onset. A two-stage procedure was invariably employed, and a cavity always easily found at the second stage. The mortality was 14 per cent, but many patients have residual disease.

The meeting was concluded by Dr. Overholt, who emphasized that bacterial infection was insignificant if early operation was employed, and that the only cases given preoperative treatment were those already in the complicated stage. In regard to time of operation, the speaker stated that these cases were considered to be emergencies and that the patients were operated on just as soon as the cavity was demonstrated. Cavities have been seen as early as ten days after tonsillectomy, in refutation of the Graham theory. The duration of hospitalization has averaged twenty-six days, in contrast to the former period of eighty-seven days. Dr. Overholt stated that the area of cavitation is not necessarily in the center of the area of pneumonitis, and that postural drainage may be employed to allow air to enter an otherwise blocked cavity and thus aid in localization. Otherwise postural drainage has been contraindicated.

MASSACHUSETTS PSYCHIATRIC SOCIETY

The annual meeting of the Massachusetts Psychiatric Society was held on Friday, November 8. The following officers were elected: president, Dr. Harlan L. Paine, of North Grafton; vice-president, Dr. W. Franklin Wood, of Waverley; secretary-treasurer, Dr. David Rothschild, of Foxborough.

Dr. Florien Heiser spoke on "The Social Etiology of Mental Disorder."

NOTICES

ANNOUNCEMENT

NEWMAN COHEN, M.D., announces the removal of his office from 536 Commonwealth Avenue to 481 Beacon Street, Boston.

BOSTON DOCTORS' SYMPHONY ORCHESTRA

The Boston Doctors' Symphony Orchestra will rehearse under Alexander Thiede, formerly concertmaster of the Cleveland Symphony Orchestra, every Thursday at 8:30 p.m. Those interested in becoming members should communicate with Dr. Julius Loman, Pelham Hall Hotel, Brookline (BEA 2430).

GREATER BOSTON MEDICAL SOCIETY

There will be a meeting of the Greater Boston Medical Society on Tuesday, January 7, at the Beth Israel Hospital at 8:15 p.m. Dr. Ephraim Shorr, assistant professor of medicine at Cornell University Medical College, will speak on "Some Recent Advances in the Endocrinology of the Female." Discussion by Drs. Samuel Gargill and Harry B. Friedgood will follow.

CONSULTATION CLINICS FOR CRIPPLED CHILDREN IN MASSACHUSETTS, UNDER THE PROVISIONS OF THE SOCIAL SECURITY ACT

CLINIC	DATE	ORTHOPEDIC CONSULTANT
Lowell	January 3	Albert H. Brewster
Salem	January 6	Harold C. Bean
Haverhill	January 8	William T. Green
Brockton	January 9	George W. Van Gorder
Gardner	January 14	Mark H. Rogers
Northampton	January 15	Garry deN. Hough, Jr.
Worcester	January 17	John W. O'Meara
Pittsfield	January 20	Frank A. Slowick
Fall River	January 27	Eugene A. McCarthy
Hyannis	January 28	Paul L. Norton

PUBLIC HEALTH LECTURES

A series of public health lectures will be held in Margaret Jewett Hall, Cambridge Hospital, from January 5 through March 2, at 4:00 p.m.

PROGRAM

January 5. The Common Background of Many Symptoms. Dr. Arlie V. Bock.
January 12. What About Cancer? Dr. W. Stewart Whittemore.
January 19. Various Phases of Plastic and Reconstructive Surgery (illustrated). Dr. Varaztad H. Kazanjian.
January 26. Orthopedics and the Layman. Dr. Robert H. Morris.
February 2. Present-Day Obstetric Practice. Dr. Alonzo K. Paine.
February 9. Immunization Against Contagious Diseases. Dr. Charles F. Walcott.
February 16. Our Food and Our Health. Mrs. Muriel L. Reese.
February 23. Your Nose and Your Throat: What about them? Dr. Edmund J. Butler.
March 2. The Control of Tuberculosis. Dr. Henry D. Chadwick.
On the Firing Line (a motion picture).

WALTHAM MEDICAL MEETING

The regular monthly clinicopathological conference of the Metropolitan State Hospital will be held at the hospital on Friday, December 27, at 8:00 p.m. Several cases of Paget's disease (osteitis deformans) will be presented by Dr. Joseph C. Aub.

All interested physicians are cordially invited to attend.

SOCIETY MEETINGS AND CONFERENCES

CALENDAR OF BOSTON DISTRICT FOR THE WEEK BEGINNING SUNDAY, DECEMBER 22

MONDAY, DECEMBER 23

12:15–1:15 p.m. Clinicopathological conference. Peter Bent Brigham Hospital amphitheater.

TUESDAY, DECEMBER 24

12:15–1:15 p.m. Clinicoroentgenological conference. Peter Bent Brigham Hospital amphitheater.

DECEMBER 27 — Waltham Medical Meeting. Notice above.

DECEMBER 27 — Danvers State Hospital, clinicopathological conference. Page 999, issue of December 12.

DECEMBER 27–29 — National Convention of the Association of Medical Students, Boston.

JANUARY 3 — Massachusetts Memorial Hospitals, staff meeting. Page 999, issue of December 12.

JANUARY 4 — American Board of Obstetrics and Gynecology. Page 787, issue of November 7.

JANUARY 5–MARCH 2 — Public Health Lectures. Cambridge Hospital. Notice above.

JANUARY 7 — Greater Boston Medical Society. Notice above.

JANUARY 9 — Pentucket Association of Physicians. Page 263, issue of August 15.

JANUARY 13, 14 — Third Annual Congress on Industrial Health. Page 999, issue of December 12.

FEBRUARY 20–22 — American Orthopsychiatric Association, Inc. Page 999, issue of December 12.

MARCH 8 — American Board of Ophthalmology. Page 201, issue of August 1.

APRIL 21–25 — American College of Physicians. Page 1065, issue of June 20.

MAY 21, 22 — Massachusetts Medical Society, Boston.

JUNE 2–6 — American Medical Association. Cleveland, Ohio.

DISTRICT MEDICAL SOCIETIES

ESSEX SOUTH

JANUARY 8 — Visceral Pain: Its relief. Dr. James C. White. Danvers State Hospital, Hathorne.

FEBRUARY 5 — Gastric and Duodenal Ulcer: Diagnosis and treatment. Dr. Arthur Allen. Lynn Hospital.

MARCH 5 — X-ray in Heart Disease. Dr. Merrill C. Sosman. Essex Sanatorium, Middleton.

APRIL 2 — Pediatric Problems in General Practice. Dr. Joseph Garland. Addison Gilbert Hospital, Gloucester.

MAY 14 — Relation of the Doctor to the Law. Mr. Leland Powers. New Ocean House, Swampscott.

FRANKLIN

JANUARY 14.
MARCH 11.
MAY 13.

Meetings will be held at 11 a.m. at the Franklin County Hospital, Greenfield.

NORFOLK

JANUARY 28 — Carney Hospital.
FEBRUARY 25 — Medicolegal meeting. 8:30 p.m. Hotel Puritan, Boston.
MARCH 25 — To be announced.
MAY 8 — Censors' meeting. Hotel Puritan.

SUFFOLK

JANUARY 29 — Page 604, issue of October 10.
APRIL 30 — Page 604, issue of October 10.

WORCESTER

JANUARY 8 — Worcester City Hospital, Worcester.
FEBRUARY 12 — Worcester State Hospital, Worcester.
MARCH 12 — Memorial Hospital, Worcester.
APRIL 9 — Hahnemann Hospital, Worcester.

Supper at 6:30 p.m. followed by a business meeting and scientific program.

BOOKS RECEIVED

The receipt of the following books is acknowledged, and this listing must be regarded as a sufficient return for the courtesy of the sender. Books that appear to be of particular interest will be reviewed as space permits. Additional information in regard to all listed books will be gladly furnished on request.

The Successful Error: A critical study of Freudian psychoanalysis. By Rudolf Allers, M.D., Ph.D., professor of psychology, School of Philosophy, Catholic University of America, and former reader in psychiatry in the medical schools of the Universities of Munich and Vienna. 8°, cloth, 266 pp. New York: Sheed & Ward, Inc., 1940. $3.00.

Medical Genetics and Eugenics. By Charles B. Davenport, B.S., A.B., A.M., Ph.D.; Clyde E. Keeler, B.S., M.A., M.S., Sc.D., fellow of the Wistar Institute, Philadelphia; Maude Slye, A.B., Sc.D. (Hon.), director of the Cancer Laboratory, Otho S. A. Sprague Memorial Foundation, University of Chicago; and Madge Thurlow Macklin, A.B., M.D., LL.D., associate professor of anatomy, Western Ontario Medical School, London, Ontario, Canada. 8°, cloth, 141 pp., with 59 illustrations. Philadelphia: Woman's Medical College of Pennsylvania. $1.00.

Fractures and Dislocations for Practitioners. By Edwin O. Geckeler, M.D., fellow of the American Academy of Orthopaedic Surgeons and diplomate of the American Board of Orthopaedic Surgery. Second edition. 8°, cloth, 314 pp., with 267 illustrations. Baltimore: Williams & Wilkins Company, 1940. $4.00.

Taber's Cyclopedic Medical Dictionary: Including a digest of medical subjects. By Clarence Wilbur Taber. 12°, cloth, 1372 pp., with 273 illustrations. Philadelphia: F. A. Davis Company, 1940. $2.50.

Studies from the Rockefeller Institute for Medical Research. Vol. 116. 4°, cloth, 609 pp., with 135 tables, 77 figures, 69 plates and 13 charts. New York: Rockefeller Institute for Medical Research, 1940. $2.00.

Loose-Leaf Specialties in Medical Practice. Vol. II. *Dermatology and Syphilis.* 8°, paper, 172 pp. New York: Thomas Nelson & Sons, 1940.

The Neuroses in War. By several authors under the editorship of Emanuel Miller, M.A. (Cantab.), M.R.C.P., D.P.M. (Cambs.), with a concluding chapter by H. Crichton-Miller, M.D., F.R.C.P. 8°, cloth, 250 pp. New York: Macmillan Company, 1940. $2.50.

Practical Handbook of the Pathology of the Skin: An introduction to the histology, pathology, bacteriology and mycology of the skin, with special reference to technique. By J. M. H. Macleod, M.A., M.D., F.R.C.P. (Lond.), physician and honorary director, Pathological Department, St. John's Hospital for Diseases of the Skin, physician for skin diseases, Hospital for Tropical Diseases, and consulting physician for diseases of the skin, Charing Cross Hospital; and I. Muende, M.B., B.S., B.Sc. (Lond.), pathologist in charge of Out-Patients' Clinic and lecturer in pathology, St. John's Hospital for Diseases of the Skin, and dermatologist, Middlesex County Council, Willesden General Hospital, Evelina Hospital for Sick Children and Princess Elizabeth of York Hospital for Children. Second edition. 8°, cloth, 415 pp., with 27 colored and 125 black-and-white illustrations. New York: Paul B. Hoeber, Incorporated, 1940. $9.00.

Organization, Strategy and Tactics of the Army Medical Services in War. By Lieut.-Colonel T. B. Nicholls, M.B., Ch.B., Royal Army Medical Corps (retired), medical officer, A.R.P., Derbyshire County, late deputy assistant director of hygiene and pathology, Northern Ireland District, assistant director of hygiene, Southern Command, India, and assistant director of hygiene and pathology, Eastern Command. With chapters by Air-Commodore A. S. Glynn, M.B., Ch.B., K.H.S., R.A.F., P.M.O., fighter command, R.A.F.; Colonel A. R. Laurie, M.B., Ch.B., D.M.R.E. (T.A.), A.D.M.S., second antiaircraft division; and Colonel F. G. Lescher, M.C., M.A., M.D., M.R.C.P. (T.A.), group officer, E.M.S. Second edition. 8°, cloth, 488 pp. London: Baillière, Tindall and Cox, 1940. Obtainable in the United States from Williams and Wilkins Company. $5.00.

Landmarks and Surface Markings of the Human Body. By L. Bathe Rawling, M.B., B.Sch. (Cantab.), F.R.C.S., consulting surgeon to St. Bartholomew's Hospital. Eighth edition. 8°, cloth, 98 pp., with 36 illustrations. New York: Paul B. Hoeber, Incorporated, 1940. $3.00.

Controlled Fertility: An evaluation of clinic service. By Regine K. Stix, M.D., research associate, Milbank Memorial Fund; and Frank W. Notestein, Ph.D., lecturer, School of Public Affairs, Princeton University. 8°, cloth, 201 pp., with 56 tables and 16 illustrations. Baltimore: Williams and Wilkins Company, 1940. $3.00.

BOOK REVIEWS

Menstrual Disorders: Pathology, diagnosis and treatment. C. Frederic Fluhmann, M.D., C.M. 8°, cloth, 329 pp., with 119 illustrations. Philadelphia: W. B. Saunders Company, 1939. $5.00.

This book is an attempt to systematize the physiology and pathology of menstruation and its disorders in the light of the newer endocrine knowledge. One wonders whether this can be successfully done while our knowledge of the endocrine glands and their interrelations is still so imperfect; this is not intended as a criticism of the book, since it is well written and well documented and represents a valuable reference book, but one that must later be supplemented or replaced. The material dealing with the concepts of menstruation, the menarche, the menstrual

cycle and the comparative physiology of menstruation are of especial importance to those interested in investigative work, because these aspects form the physiological, histological and clinical framework within which the jigsaw fragments of research must form their picture.

The Way Life Begins: An introduction to sex education. Sixth printing, revised edition. By Bertha Chapman Cady and Vernon Mosher Cady, with a foreword by William Freeman Snow, M.D. 8°, cloth, 80 pp., with 19 illustrations. New York: The American Social Hygiene Association, 1939. $1.50 (paper, 50 cents).

That Dr. William Freeman Snow, long connected with the American Social Hygiene Association, should write the foreword gives assurance that a careful reading of this book will yield substantial information and guidance. It was first published in 1917 and is now in its sixth printing. The way life begins in the lily, moth, fish, frog, chicken, rabbit and man is told in a simple, scientifically accurate manner with due regard for its moral significance. The illustrations are excellent. One can recommend the work highly to parents and teachers interested in sex education.

Dental Roentgenology. By LeRoy M. Ennis, D.D.S. Third edition, thoroughly revised. 8°, cloth, 398 pp., with 789 illustrations. Philadelphia: Lea & Febiger, 1939. $6.50.

This revised edition has much to recommend it, not only to dentists but to physicians who practice dental roentgenology. The chapter on roentgen-ray dermatosis should be read by every prospective purchaser and user of a dental x-ray machine. There is little excuse today for damaged fingers and self-imposed martyrdom.

The author's discussion of osteoradionecrosis as a complication of irradiation is an important subject, unfamiliar to many dentists. Irradiation, trauma and infection appear to be the trilogy responsible for the production of osteoradionecrosis. It does not occur as a result of diagnostic roentgen examination of the teeth, but sometimes follows heavy irradiation for intraoral or neck cancer. A careful inspection of the mouth should be made, and all dental conditions should be corrected before beginning irradiation. The opinion now held is that no extraction of teeth should be made for at least six months following intensive therapeutic irradiation.

The illustrations are excellent. One wonders if omission of tube and transformer construction, the chemistry of photographic processes, dark-room technic and methods with their accompanying illustrations would not make the book less costly and at least as useful.

Fundamentals of Dentistry in Medicine and Public Health. By John Oppie McCall, D.D.S. With a foreword by Wilson G. Smillie, M.D., Dr.P.H. 8°, cloth, 161 pp., with 50 illustrations. New York: Macmillan Company, 1938. $2.75.

This concise but well-illustrated presentation of the more important problems of both healthy and diseased teeth should help materially to meet the immediate needs, in this field, of physicians, medical students and those concerned with public health.

The basic facts offered in the chapters on embryology and histology provide a good review background for the discussion of the diseases of the teeth and their supporting structures.

Malocclusion, a condition with far-reaching effects but frequently slighted in general discussions of dental problems, is well handled. The author presents a rational discussion of the subject of dental caries, the exact etiology of which still remains unsettled. In view of the new accumulated knowledge that nutrition may play a major etiologic role, the subject of dental caries becomes of vital interest to physicians. Dental infections per se are not unduly emphasized in this book. This is somewhat of a relief because of the concentrated attention the subject has received during the last few years. On the other hand, the book would have been more valuable if the last chapter, entitled "Dental Disease and Public Health," had been given greater attention.

The book is well printed, and its compactness makes it readily available for reference.

The Rise of Embryology. By Arthur William Meyer, B.S., M.D. 8°, cloth, 367 pp., with 97 illustrations. Stanford University, California: Stanford University Press, 1939. $6.00.

This book will be heartily welcomed by students and scholars as another tool in the study of the history of science. It is the fruition of several decades of scholarly research and lecturing in this field. The reader is led through the highways and byways of the history of embryology — including the epochal discovery of the ovum and the dog's ovary by Karl Ernst von Baer — to the first half of the nineteenth century. One finds the raw material of knowledge as well as the concrete facts which make science. The author accomplishes his purpose by offering the reader opportunity to read something of the original text of many of the important writers. This is one of the essential merits of the book.

In the preface, the author states that his aim is "to give the history of the basic ideas of embryology; to reveal facts, not to utter dicta; to indicate something of the intellectual attitude and the atmosphere of the time."

In the beginning it is pointed out that primitive ideas on sex were not grotesque, but based on observation and experiment in the light of the then accumulated knowledge. The author then gives citations from the sacred books of the East, Holy Writ, Hippocrates, Aristotle and Galen to indicate the early historic ideas of generation. The succeeding chapter deals instructively with the development of theoretical ideas concerning spontaneous generation, epigenesis, preformation, pangenesis and panspermia; it shows that the studies of Wolff and Pander sounded the doom of the preformation doctrine, and the investigations of von Baer tolled its death knell. The story of the search for the mammalian ovum is one of the most interesting and arresting accounts yet written; a keen discussion of the epoch-making contribution of von Baer is included. The understanding of the process of fertilization, the author shows, had to await the discovery of the spermatozoon and the observation of its entrance into the mammalian ovum. Dr. Meyer draws attention to the interesting fact that the word "mule" was used in the eleventh century, whereas the modern word "hybrid" came into use about the seventeenth century. The reader will find succinct comments regarding the fabulous, the objective and the scientific periods of the problem of malformation. An analysis of the investigations of Aldrovandus, Coiter, Fabricius, Harvey, Malpighi, Hunter, Wolff and von Baer explains some of the factors responsible for the growth of the study of morphology.

The author includes a brief yet profitable discussion of the history of the microscope, the invention of the microtome and the development of microscopical technic. The final chapter brings important evidence to show that the

story of experimental embryology is inextricably interwoven with the general history of embryology, and for that reason it is incorrect to say that "until 1859 embryologists were content to follow changes in form" or to assert categorically that "Roux was the creator of experimental embryology."

The excellent bibliography is worthy of careful study. There are approximately 385 references, of which about 140 belong to the twentieth century, 135 to the nineteenth century, 65 to the eighteenth century and 45 to the seventeenth century.

Despite minor errors, apparently now familiar to the author, the reader will easily recognize that Dr. Meyer combines with his ability to present the material in a critical, provocative manner a deep sympathetic knowledge of his subject. Considered from the point of view of another contribution to the history of science, this volume gives added weight to the following words of Professor George Sarton*: "The latest results are like the new fruits of a tree; the fruits serve our immediate practical purposes, but for all that, it is the tree that matters."

Students, teachers and all libraries should own a copy of this valuable book.

*Sarton, G.: *The History of Science and the New Humanism*. 216 pp. Cambridge, Massachusetts: Harvard University Press, 1937. P. 5.

A Textbook of Pathology. By W. G. MacCallum, M.D. Seventh edition, thoroughly revised. 8°, 1302 pp., with 697 illustrations. Philadelphia: W. B. Saunders Company, 1940. $10.00.

This is the seventh edition of what may be called the most scholarly textbook of pathology in the English language. Published first in 1916, this book broke with tradition in the organization of its contents. There is no division into general and special pathology. The reaction of various parts or systems of the body to injuries, such as obstruction, bacterial diseases, disturbances of fat metabolism or local disturbances in the circulation of the blood, forms the basis of this method of teaching. Throughout the book, stress is placed on the causes of disease and their effects in disturbing the functions of the body. The illustrations are all of high caliber, and they do much to clarify the subject matter. The style throughout is clear and readable.

Professor MacCallum has revised his book in the light of developments since the last edition four years ago. Consideration is given to the world literature in the treatment of the subject matter. The experiences and critical judgment of the author, however, are evident on every page. Nowhere in the text does the author fail to live up to the statement of Goethe that he chose for his preface: "It is only when we know very little about a subject that we are quite sure; and with knowledge, doubt arises and grows." For the thoughtful student a better introduction to the study of disease could not be chosen.

The Emperor's Itch: The legend concerning Napoleon's affliction with scabies. By Reuben Friedman, M.D. 8°, cloth, 82 pp., with 10 plates. New York: Froben Press, 1940. $1.50.

For over one hundred years it has been considered by many that the skin irritation from which Napoleon Bonaparte suffered was scabies. Dr. Friedman, well known as a dermatologist, who has written extensively on this disease, has now investigated this problem and has come to the conclusion that the disease was probably dermatitis herpetiformis.

Napoleon is supposed to have developed the disease at Toulon and suffered from it for the succeeding nine or ten years. At the end of this period, he engaged the well-known French physician, Corvisart, as his private doctor. It is reported that under Corvisart's direction the symptoms rapidly abated, although it seems certain that Napoleon was never permanently free of pruritic crises. Such crises occurred while he was at St. Helena and caused him to seek relief by excoriating his skin. Incidentally, Dr. Friedman believes that the characteristic pose assumed by Napoleon, with his right hand under his waistcoat, was not the result of his skin eruption, but a mannerism cultivated from his earliest days. Finally, it is pointed out that the medicine used by Corvisart has no effect on scabies or on dermatitis herpetiformis. Napoleon's confidence in his physician enabled Corvisart to apply psychotherapeutic measures, a method often useful in treating dermatitis.

This book is an interesting study, carefully worked out by an expert in the field. There are numerous illustrations, not all of them particularly well reproduced. The text is written in a straightforward style, occasionally with an amusing touch. The author tends to overemphasize his own conclusions, and thus the book must be considered as a personal record rather than a carefully considered historical document.

The general appearance of the book needs comment: the format is not pleasing, and much of the printing is poor. Furthermore, the author has allowed the publisher undue liberties which do not bring credit to either.

Diathermie Chirurgicale. By Dr. C.-A. Arraud. 8°, paper, 216 pp., with 52 illustrations. Paris: Gauthier–Villars, 1939. 50 Fr. fr.

The first seven pages of this book are a brief but inclusive résumé of the history of the subject from d'Arsonval to Howard Kelly. An orderly discussion of high-frequency currents and the various types of electrodes, both monopolar and bipolar, then follows. The section on long-wave and short-wave currents is particularly good. A brief rather optimistic chapter compares electric coagulation with freezing, electrolysis and x-ray and radium therapy. Finally the products of various French manufacturers are reviewed.

The author discusses the use of physiotherapy in cancer. The discussion is good so far as small external cancers are concerned; beyond that the material is unsound, at least from the point of view of American medicine. The chapter on various affections of the skin is overenthusiastic, particularly in the treatment of pigmented moles and keloids. The reviewer believes that it is extremely dangerous to treat pigmented moles in the fashion the author recommends. To treat varicose veins by diathermy, as is strongly advised, seems ridiculous.

The treatment of carcinoma in gynecological conditions is sound, but to recommend electric coagulation as an adjunct is open to question. The section on transurethral resection of the prostate is particularly good; however, the reviewer cannot share the author's enthusiasm in the treatment of cancer of the rectum.

The discussion of the use of diathermy in the nose and throat is adequate except that the author recommends the destruction of tonsils. This is contrary to what is considered the best surgical procedure in America. His treatment of the subject of diathermy in ophthalmology is also open to considerable question.

The book is badly bound and printed, but written in an orderly fashion. The author is obviously an enthusiast, and goes too far in his recommendation of various forms of physical treatment.